# JOURNAL OF GAS LIGHTING & WATER SUPPLY.

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## EDITORIAL NOTES.

### Fair Residuals Clauses this Session.

IN the long drawn-out controversy over the residuals restrictions, the contention of the gas industry was simply and solely that there should be freedom of trading in respect of their secondary products—a freedom of trading equal to that enjoyed by chemical manufacturers, by coke-oven owners, and by others. Though Parliament at first listened to the plea of the chemical manufacturers, that the gas industry should be shackled while they should be allowed full liberty, the Joint Committee of both Houses of Parliament who were deputed to consider the matter reported entirely in favour of the attitude and claims of the gas industry. This should have finally disposed of the issue. On the contrary, however, in the session of 1914, the restriction of the power to purchase to the equivalent of one-third of the residuals production of the purchasing gas undertaking was imposed upon the South Suburban and Swansea Companies; and then, when the "Model Clauses" were published, in preparation for the present session, it was found that the new clause referring to gas-works residuals still contained the one-third limitation.

Against this infringement of the liberties of the gas industry, and the violation of the report and recommendations of the Joint Committee, protest was made in our leading columns on Nov. 10 last, and the promoters of Bills in the then approaching session were strongly advised to again ask for, and defend, the principle of freedom to the full extent. So keenly in the industry was the injustice felt, that there was quickly talk of taking more drastic action by large concerns more freely entering upon the manufacture of sulphuric acid and the work of tar distillation, and the proprietors of gas undertakings forming distinct district companies with separate capitals for dealing in and developing the residuals of gas manufacture. Nothing but the unfair action of the chemical manufacturers would have led to these suggestions, which, if carried out, would be infinitely worse for them than maintaining the freedom of residuals trading that the gas industry desired, in order to realize the best possible market prices to the advantage of its undertakings and their consumers. The restriction to one-third of the home production might not be a particularly harmful one for some gas undertakings, but it might be for others. The objectionable aspect of it is the recognition that it made—not by the Joint Committee of the two Houses of Parliament who were instructed to adjudicate upon the matter, but by one or two Select Committees not specially appointed to inquire into it—of the principle of limitation; and against this the industry was dead-set. In this recognition of limitation, there was a potential danger.

Then came the difficulty in which the country found itself in the matter of explosives for the war, and the ingredients for their production—toluol, carbolic acid, sulphuric acid, and so forth—and, while feeling a little sympathy for those in parliamentary authority who had, at the instance of the pocket-interested chemical manufacturers, meddled with the gas industry, we felt bound to point out to them, in the "JOURNAL" for Feb. 16 (p. 370), that had it not been for the gas industry, and its ability by certain developments in its residual processes, to increase the production of the ingredients for explosives of which the country was in dire need, the country would have been in an awkward position—both in the present and in the future.

It is hoped the lesson has been taken well to heart. There are signs—assuming we read them correctly—that it has. Among the statutory gas company Bills introduced for the current session, there were three that dealt with the question of residual products, and not one of them adopted the model residuals clause with its unjust restriction; but the promoters asked, and were prepared to fight again, for the principle of freedom for which the industry intended to contest time and again. The three Bills were those of the Ormskirk, Prescot, and Warwick Companies. In the Ormskirk Bill, the Company sought to be put in the position of free traders in residuals, by the adoption of the old form of clause permitting them to "convert and manufacture, purchase, deal "in, and sell residual products resulting from the manu- "facture of gas." The Warwick Company also asked for the right to "purchase, manufacture, convert, supply, sell, "and deal in all residual products resulting from the manu- "facture of gas." The Prescot Company merely desired open powers to "convert and manufacture residual products "resulting from the manufacture of gas." What has happened is that the new model clause has been inserted in the three measures, *minus* the provision as to the restriction of purchasing rights to the equivalent of one-third of the home production. Without the proviso, the model residuals clause, as it now stands in the three Acts, gives the gas industry all it wishes. It wants the right as allowed in these Acts, (*a*) to work up and convert the residual products arising directly or indirectly from the manufacture of gas by them; (*b*) to purchase the residual products arising from the manufacture of gas by other gas undertakings, and therewith manufacture other products of the same kind as the company are manufacturing from their own residual products; and (*c*) to purchase from other gas undertakers and elsewhere, and use, the materials required to work up and convert the residual products so arising from their own manufacture of gas or purchased as aforesaid. The gas industry has no objection whatever to the prohibition that a gas undertaking shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the company or purchased from other gas undertakings is merely subsidiary. As we have said, the clause as it is in the Ormskirk, Prescot, and Warwick Acts, shorn of the "one-third" restriction, gives all the industry desires for its own protection. It is hoped that, as the clause appears in the three Acts named, so it will be generally granted without any further contention. If this proves so, we have arrived at the end of a very unpleasant piece of business.

### Consumers as Capital Providers.

AS we were recently pointing out, sufficient has not yet been done in tapping the man with a capacity for small savings for helping in the capitalization of industrial enterprises in this country—especially industrial enterprises carried on under the protection of special parliamentary powers. Some gas undertakings many years since recognized that here was a potential source of capital, and have since proved the correctness of their faith. But other gas undertakings have passed by the "small" man, and have made no special appeal to him, preferring to keep to the old ways of selling by public auction or tender, and maintaining their stockholding register as compact as possible, instead of extending the number of holding units towards the lower scale in amount. They make a huge mistake. An enormous part of the gas industry's business is now constituted of the patronage of consumers on the small scale; and every opportunity should be specially given to these, as well as to ordinary consumers, to make the local gas company the place in which profitably to invest their savings. For business reasons, the more the co-operative character of gas undertakings is developed, and the greater the financial interest of the consumers in a gas undertaking, the better. Such an interest is a source of trading strength. The Government only recently recognized the power of the people who save as providers of capital by inviting them to subscribe to the War Loan in small amounts; and there has been a healthy response—the small investor realizing that he is getting a better return on his savings in this way than he can do through any of the ordinary channels for accumulating small

amounts of savings, except in ordinary times a well-established gas company. The South Metropolitan Gas Company have found the consumer a useful provider of capital. They have lately, with the sanction of the Treasury, been offering stock to the amount of £100,000 to their consumers and employees; but prior to this the consumers had invested £1,430,000 in the Company, in consequence of invitations to subscribe for stock. We repeat that the gas consumer as a source of capital provision should not be ignored. As things are seen at the present time, we fancy the companies who have not tapped this source before will in future have to look upon it with greater favour, and not neglect it.

Although in the British gas industry, issue of stock to consumers and employees has been long practised by several undertakings, the "Electrical Times" goes to America for illustration of this method of raising capital; the opportunity being the issue of stock to consumers and employees by the Pacific Gas and Electric Company, and two other large concerns. By staying at home, our electrical contemporary might have obtained antecedent illustrations. As a matter of fact, some of the American gas and electricity undertakings have done the British gas industry the honour of extracting several notable items out of its policy and methods of procedure. The British gas industry gave birth —Sir George Livesey being the originator—to the sliding-scale system of price and dividend as applying to a *quasi*-public service; and its author also perfected it by—away back in the Eighties—bringing in the employees as co-partners. And long ago, he was practising the method of issuing stock in small sums to consumers and employees. We are pleased to see the Pacific Coast Gas and Electric Company have done so well over the issue of capital to their consumers. Our contemporary says the Company wanted capital for extensions; and they were advised by the supervising authorities to create a new issue of first preference stock. "Up to the end of last May, they had sold on "an average 17·47 shares to each consumer, 3·37 shares to "each employee, and a still larger quantity to 'consumers "'and others.'" The "consumers and others" took up no less than £717,000 worth of the stock. This is an excellent result. Our contemporary commends to electricity undertakings the scheme of profit-sharing as a possible compromise in the movement of labour for a larger share of benefits in a business, and the issue of stock to consumers as a means of promoting closer relations between householders and the electrical department. Unfortunately, for the success of such a scheme in the British electricity supply industry, the greater number of the undertakings are under municipal management, in which there are not the necessary fundamentals to success. We do not think that the interest that local governing bodies are desirous of paying for their loans is of a sufficiently weighty character to attract the small investing consumer. Nor does the system of municipal ownership lend itself to the giving of employees a stock-holding interest in the concern as through the co-partnership scheme of the gas industry. There are profit-sharing or bonus schemes in connection with municipal electricity concerns; but they are profit-sharing schemes and nothing more, with evanescent effects compared to the permanent effects arising from co-partnership.

## Gas Workers and Munitions Work.

THE large and still increasing range of mechanical operation in gas-works has brought into being in most of them fitting-shops well-equipped with machine tools for the carrying out of repairs, reproducing parts for renewals, and for realizing economy in some of the constructional work. These were the peaceful purposes for which the fitting-shops were planned; and it is safe to say that it never crossed the mind of anyone that many of the shops would ultimately be devoted to the production of parts of such instruments of destruction as shells and bombs. But it is so to-day; and the gas industry is pleased to be of national service in this way, as well as in others. It has not been—the industry has before proved its adaptability to varying circumstances—at all a difficult thing to turn the shops from the one purpose to the other; and the mechanics of the industry (those who have not been able to go to the front) have been pleased to have this chance of applying their skill in the country's cause. Even were they all physically fit and of military age, such a public service as gas supply could not let the whole of them go. The numbers have been so reduced now in most works that more mechanics could not be spared full time to go into munitions factories. But there are these fitting-shops on the gas-works themselves. Their help is wanted by, and is valuable to, the country; and the gas-works mechanics can in them put in variously a number of hours a day in producing munitions, and so working directly for the country. This assists materially to mitigate the feeling that they are not doing all that their skill would enable them to do in the country's cause could they give full time to the work. Work of the kind—if the Munitions Department accepts the services of a gas undertaking—is something to be encouraged, as there is no doubt that it does help to keep the men well together. The matter was one to which the Chairman of the Bournemouth Gas and Water Company (Mr. G. Crispe Whiteley) and the Acting Engineer and General Manager (Mr. P. G. G. Moon) made special reference at the meeting of the proprietors last Friday.

## Gas as an Aid to Industrial Economy.

THE country has been lately bombarded with economic principles, and with much of a theoretical and abstract character bearing on the subject; but there has been little attempt to focus all this by practical illustration. In an article in "World's Work," Mr. James Armstrong gives practical treatment to the subject in relation to industry. We do not know the author; but whoever he is, he does a service to industry generally, including that engaged in the supply of gas.

There is no question but that the war has roused many somnolent British manufacturers to the need for departure from the old ways, and entry upon, and perseverance along, new ways. But there is still much work to be done to raise the country to the highest possible state of industrial efficiency. Until the War Office gave many of our manufacturers work to do that they had not touched before, there were those among them who had never attempted to turn out more than one class of goods, and that class produced by traditional stereotyped methods. The idea had not struck them that their ground area, their plant, their men, themselves could all possibly be improved and made more productive. But the war has marvellously expanded ideas; and things are now being seen through new glasses. And not a bit too soon. Germany had made war on our industries, had detected the most vulnerable place in them, and that place formed by the contentedness of manufacturers to preserve things as they were, and without any aspiration to effect progress by developing new ways and gaining new knowledge. Germany found the road to an ascendancy, in many directions, over British manufacturers by doing what the latter declined or neglected to do. Fortunately, the eyes of many British manufacturers are now open to these things; and there is no doubt that, in the history of the progress of British industrial economy, Germany will stand as the British manufacturers' greatest incentive to change, and to the breaking-down among them of conservatism and prejudice. We may, at all events, give Germany its due in this regard.

To return to Mr. Armstrong's article. He heads it "Town "Gas: The Money Maker." The title should appeal to the manufacturer. Money-making is his objective; and the nation only lives and prospers through it. The extent of money-making in industry is largely controlled by the factor of economy. If one manufacturer, by the adoption of economical methods, can produce at a cheaper rate than a manufacturer who clings tenaciously to established customs, the latter, with less economical production, must cut down the profit on his goods in order to compete with the former, who is enabled to sell at the lower price and still maintain his profit solely through reducing cost by having recourse to new processes. This is a point made by Mr. Armstrong; and it is precisely the line of action that Germany was taking, to its industrial and therefore national benefit, in competing with us. By new processes, the German manufacturers were cutting down the cost of production; and by new processes they were extending the range of goods put on to the world's markets—our own included. That is one reason why the British manufacturer must search for and adopt more economical processes, and relieve himself of the shackles of long custom. Another is that, in these days of stress, the prices of commodities required by manufacturers are soaring to unprecedented heights. The higher the costs, the higher the selling price; and the cute manufacturer knows that in many productions the higher the price, the more restricted becomes the market. It is his

business to counteract the rising tendency of material as far as possible.

The two worst enemies of the British manufacturer (there is not much of which complaint can be made in connection with the gas industry nowadays, though the past has its illustrations of backwardness) have been, Mr. Armstrong points out, conservatism and prejudice; and he still looks upon them as formidable. They are. But they will not henceforth stand the hard knocks that will be administered by the progressive application of economical practices by competitors, both at home and abroad. We believe that more will be done in the destruction of these two old enemies by the force of rival enterprise, and the demonstration of success following the application of economical processes, than by any other means. This is already being seen in connection with the economy offered by gas in the factory. This is Mr. Armstrong's illustration; and by it he shows how gas is a money-saver. The steam-raising plant and the steam-engine (not including the turbine for large power work), with their space requirement, and all their attendant losses, are surviving children of tradition. Conservatism and prejudice have maintained them in their places so long; yet the gas-engine occupies less space, is always ready, saves time, and has no stand-by losses. There we have one direction for money-making through economy. But the use of gas for heating in industrial operations is the major illustration in the article in "World's Work." It is a strong and eye-arresting assertion that "the advantages derived from the "use of gaseous fuel may mean the difference between "profit and loss in production." Strong as it is, there are no doubt cases in which it is quite true; there are cases in which it will become more true as the over-all economy of gaseous heating is brought to bear upon the competition between manufacturers.

Incidentally, Mr. Armstrong shows in his article the folly of manufacturers taking only fuel costs for comparison and decision. He gives an illustration—a case in which 8 million cubic feet of gas a year are used now—where, in comparison with coal, gas-furnaces effected a saving of £269 in one year in the fuel bill. But this was not by any means the sum of works economy yielded by gas operation. By the introduction of gas-fired furnaces, two thirds of the floor space was released. "In other words, "it was quite possible to treble the existing output of the "works, if desired, by installing further plant"—thus enlarging the factory output without the erection of any additional buildings. This means a large saving in capital and other charges, combined with the saving (in the example) by being able to dispense with the service of a stoker, and by the old supervising staff being better capable of performing their functions than they would be by having to cover a more extensive ground area. About the economy produced by being able to regulate temperatures as desired—so securing not only improved, but more regularity in, quality—and about the cleaner and healthier factory conditions, we need not say anything here. They all go into the balance in reducing cost of output; and they all show how town gas can be made in industry a more prolific producer of profit by raising the standard of economical working. It is true the price of gas has risen. So has the price of other fuels, and to a greater extent. Moreover, the variations of the price of gas are not of the capricious order that obtains with other fuels. In the "world's work," it is a very safe prophecy, gas is going to take a greater place than ever.

## Meanness in South Wales.

When the whole country had thought that peace had been restored in the South Wales coalfield, and that, at any rate during the war and for some time after, there would be no further difficulty, it is again thrown, through discord in the same quarter, into gloomy suspense. The agreement between owners and miners which it was believed would have been signed to-day is not signed; and there are over 10,400—that was the number reported at the end of last week—miners on strike, and threats of more malcontents coming out. Whatever the cause of the discontent, these men are acting treacherously against the country when every man's actions should be set resolutely to the one object of making the defeat of the enemy as quick and certain as it can be. When men act as the South Wales miners have done, and are doing, at such a time as the present, it shows that high principles and honour have no real existence with them. Self-interest alone moves them; for it is admitted that they earn good wages, and have really nothing to complain about in this regard. After what has happened, it seems almost impossible to further rely on their word. When the settlement was arrived at in July, and reference was made to the President of the Board of Trade to determine as to the terms of the new agreement, it was resolved between the Monmouthshire and South Wales Coal Owners' Association and the South Wales Coal Miners' Federation that Mr. Runciman's decision should be final and binding. But within twenty-four hours of the issue of his award, there were miners who had left their work, totally callous as to the result of their action upon the country in the terrible struggle in which it is engaged. Men who are capable of such action are not worthy the name of Britishers.

Whatever the cause of the dispute, there is no excuse for the men's action. The award was to be "final and binding." Yet the men refuse to accept it; and, through the power of numbers and the condition of the country sorely needing the results of their labour in and about the pits, they have compelled a reopening of certain questions, which could have been reconsidered without such drastic method of compulsion as that to which they have resorted. Only two material points have been raised by the men; and, in regard to the main one, it is a question for determination as to what was the understanding at the time of the settlement which returned the men to work in July. The men contend that the award itself transgresses the understanding. If it does, it is only right that there should be adjustment. But the whole tenor of the award is against the men on the point in dispute. Mr. Runciman dealt with the questions submitted to him in the abnormal conditions of the times, and held that his decisions were not to be taken as precedents affecting normal times. This being so, the new agreement to be effected under the award is only to continue during, and for six months after, the war; and its termination is then to be subject to three months' notice from either side. On the greater number of points—these the minor ones—the award is opposed to the men's requirements. But it is averred on their behalf that they accept these, but not the alleged violation of the understanding arrived at in July. In lieu of the standard of wages prevailing prior to July 15, Mr. Runciman has decided that a new standard shall be established by putting 50 per cent. on the 1879 standard; and, with 10 per cent. added thereto, the result is to operate as the minimum wage. But there is to be no standard rate of less than 5s. a day. This applies to underground workers; and surface workers are also to have the same minimum. Of course, this minimum is not the actual; one authority putting the average wages of the South Wales miners at from 6s. to 8s. a day. From the wages point of view, therefore, there is no excuse for the drastic action of the men.

This brings us to the gravamen of the dispute—the alleged point of provocation. As mentioned, Mr. Runciman's award is based on the extraordinary conditions of the time, and is confined to the duration of these conditions. Through this limitation, he appears to have fallen between two stools. He decided in favour of the contention of the coalowners that, under the conditions of the settlement in July, there should be no changes in the terms of employment or in the ordinary machinery under which the parties usually conduct their affairs, other than such changes as might be due to these terms, or were consequential thereupon. Mr. Runciman's decision excludes all enginemen, stokers, and craftsmen from the rule as to five turns being counted as six for afternoon and night shifts, which is the men's main grievance—they averring that, under the agreement of July, all classes of workers were to be included in the bonus turn, although on the mechanical side the workers have for years been outside the scope of general wages agreements. There is no reason why there should be any disturbance of this custom now; but if there was an understanding in July that these men should be included, then the understanding ought to be honourably complied with. The men also desire the agreement to be retrospective—dating from July 20 last.

The above are the two causes of the present dispute—the former being the more important in the eyes of the men. But when the whole of the circumstances are taken into account, it is impossible to find a single palliating circumstance in favour of the action of the men. There must be something inherently wrong about men who accept arbitration as a means of adjusting differences, and then reject the findings, after binding themselves to accept them as final. If, in the decision, a condition of the arbitration is assailed or neglected, there should be some more peaceful means of

setting the matter right than the one adopted by the men in this instance, which jeopardizes national interests in a great crisis. We hope a lasting settlement will soon be reached; and the quicker the better. There is no reason why it should not happen even before this article is published.

## The Distribution of Radiant Heat.

Recently a reference appeared in the "JOURNAL" to the opposing conditions that exist between the situation of a fire place in a room and the uniform and effective distribution of radiant heat. A source of heat located at one side of a room, and one from which the radiant heat energy proceeds from a straight, or slightly bow-shaped, face of incandescent fuel, cannot possibly perform its functions with the best results. The field of radiant heat distribution is limited. To get ideal results, the field of distribution should be the area defined by the walls of the room. The remarks formerly made on the subject [see July 27, p. 177] were prompted by the production of a new circular gas-fire. At the time, we were not aware that the Richmond Gas Stove and Meter Company were at work on, and had arrived near the point of production of, a fire with radiants placed in a semi-circle, so that the radiating energy makes lateral, as well as frontal, attack upon the solid bodies in, and walls of, the room. The development of the fire has been completed; and we are in a position to describe and illustrate it in this week's issue. In addition to enlarging the field of radiant heat distribution, it will be seen that the construction of the new fire promotes a higher radiant heat efficiency, as well as increases the ventilation of the room in which it is used. The descriptive article and illustrations may be left to speak further for themselves. We congratulate the Richmond Company upon this innovation. There has been room for striking-out in new directions, with the object of raising utility and general efficiency. They claim that it is a definite departure; and the description and illustrations show that the claim is fully justified and merited. We anticipate a successful outcome to this fresh evidence of enterprise, and at a time when the inducements to introductions of the kind cannot be said to be at high-water mark. Novelty, combined with large utility, will help to draw fresh custom to gas undertakings; and this should not be overlooked.

## Gas Consumption and the War.

War conditions have been responsible for upward or downward curves in the consumption diagrams of different gas undertakings, according to the manner in which these conditions have affected the particular locality concerned. There is an instance of the upward curve provided by the Brighton and Hove Gas Company, who have in the past half year experienced the largest increase in sales that has ever been recorded in the history of the Company for one half year. The gain amounted to over 6½ per cent.; and in one particular respect the figure is even better than it looks. That is to say, as was pointed out by Mr. A. M. Paddon, the Chairman, at the meeting last week, that while the actual increase had amounted to over 50 million cubic feet, there had along with this been a falling off of 14 million cubic feet in the quantity of gas sold for public lighting. Thus the consumption for other than public lighting purposes was greater by 64 million cubic feet than in the six months with which comparison was made. First among the reasons for the increase in business, the Chairman placed the fact that the population had been swelled in consequence of the military precautions taken in the locality; but he also gave part of the credit to the moderate price at which the Company are able to sell gas, in these times of dear coal. The additional work that has been accomplished during the past six months is all the more remarkable when it is remembered that nearly 40 per cent. of the employees are on active service—and these, as Mr. Joseph Cash (the Engineer) fairly pointed out, are the best men. Looked at from all points of view, the record placed before the proprietors is a highly gratifying one; and the appreciatory remarks which were made at the meeting had been well earned by all those to whom they had reference.

## The Abused Gasholder.

Until the judgment day, providing coal and oil supplies hold out for gas making, the gasholder will, we suppose, be a target for those artistic fanatics whose ideals extend no farther than colour, combination, and natural form. A gasholder seen from a train stirs up the ire to boiling-point of the so-called artist; the smoke and spark emitting engine, the noisy, rumbling train, running on a sinuous permanent way cut and laid through the very heart of Nature's beauty, do not excite him. The worshipper of beauty is riding in the one, and sees the other. Were he standing on the gasholder and from its height surveyed the beauty of the landscape, he would then revile the railway track and the hideous engine and train. The "Daily Chronicle" recently stated that an "artist from abroad" finds a gasholder somewhere in Surrey a cause of great annoyance; and he seems to think that such structures ought to be decked out in some fantastic style to make the beautiful piece of engineering work and utility look like something it is not. We are not in favour of theatrical "make-up" being brought in as an aid to engineering work. What is wrong about the whole matter is that the artist whose conceptions of beauty are limited to colour, combination, and form sadly wants his ideals cultivated so as to comprehend the fact that he has not a monopoly of art, and that art extends to the work of the engineer. Besides engineering art being possessed by the gasholder, it is a structure of utility—from out of it comes usefulness, value, convenience, comfort for humanity, and much else. Some of the productions of the artist are neither beautiful nor useful.

## Intern the Structure.

Wilmot Corfield in "The British Architect" waxes sarcastic over the renewed absurd attack on the gasholder. To him, a reformed gasholder would be worse than a converted submarine, or a Zeppelin transformed into a summer arbour. It would be a gasholder spoiled, unsatisfactory as either submarine or Zeppelin. He makes a suggestion, but not seriously, Why not intern the gasholder? The answer is that nobody likes to be interned—not even Germans; and those who are responsible for such works of utility as gasholders prefer to have them where they can be readily seen, examined, and kept in good working order. The Germans would not think of so ill-treating a gasholder; they prefer that they shall be set on a hill so that they shall not be hid. The "hill" is a large reinforced concrete structure, the roof of which is the base of the water-sealing tank of the holder, and the under-part forms a store, into which loaded railway waggons can be passed. Thus economy of ground area projects the beautiful curves of the holder, and the standards and bracings which incorporate so much engineering art, into stronger view of the artist's eye. But perhaps artists in Germany have a deeper perception of the beautiful than, or do not lay claim to a monopoly of the beautiful as do, our home-bred artists, and artists from countries other than Germany. Wilmot Corfield suggests to those who are displeased with the symmetrical lines of the holder that "holes" should be made deep and large enough, so that the holders could be fully interned when inflated. Cost? That is a simple matter. "The cost of the conversion of existing gasholder slots to bring about the internment of these eyesores all the land over could be met out of the rates." The crescendo of satire spends itself in the lines: "After the gasholder, the Albert Hall. Turn a handle, and down would go the Albert Hall until wanted again, adding an acre or two to London's open spaces in the interval."

## Pipe-Laying and Reinforced Concrete for Roads.

The necessity for improving road crusts owing to modern traffic has not lightened the expenses incurred by those who have to use the subsoil for the accommodation of their distribution systems. Concrete foundations have added to difficulty and costs in respect both of opening and reinstatement work. When, therefore, it is suggested that the concrete should be reinforced, this is sufficient on first blush to make pipe and cable owners stand aghast. It will be remembered that some time ago the Woodford and Wanstead District Councils decided to repair their roads with reinforced concrete; and the Gas Light and Coke Company applied for an injunction restraining them from doing so. The Company, however, took the very fair course of saying that, if experiments proved that there was no more difficulty with the reinforced concrete than with ordinary concrete, they would be satisfied. The action was subsequently withdrawn, through, according to the Clerk to the Woodford Council, experiments having demonstrated that the reinforced concrete was no greater hindrance to the Company's operations than ordinary concrete. Of course, this depends on the nature of the reinforcement. Some particulars are given in the "Times Engineering Supplement" of the system of the Loop Road Reinforcement Company. In this case, the reinforce-

ment consists of parallel steel rods looped together by wire. The rods may be either in one horizontal plane or alternatively in two planes—one near the surface and the other near the base of the concrete, and may be either parallel to the longitudinal axis of the road or at an angle of 45° with it. It appears that the system allows of a lessened thickness of concrete than when no reinforcement is used, and that the reinforcement can be conveniently laid after trench openings. All the same, pipe owners must, we repeat, exercise care as to the character of the reinforcement employed.

### Trading with the Enemy.

A study of the official figures published from time to time will provide sufficient justification of the warning to exporters which is issued by the Board of Trade, who direct the particular attention of all manufacturers and traders concerned in the export trade to the need for scrupulous care in the transaction of their business abroad. While expressing confidence that they can rely upon the cordial co-operation of firms engaged in foreign business to secure the successful working of the Government's reprisals policy, the Board do not omit to point out that the proclamations relating to trading with the enemy cover indirect trading through neutral agents, and that carelessness in transacting neutral business may thus involve traders in severe penalties. When this reprisals policy was inaugurated, in the early part of the year, it was, of course, directed to the suppression of all enemy trade, whether import or export. But unfortunately the main difficulty in making the policy thoroughly effective arises from the fact that "some traders in some neutral countries are making themselves agents for the supply of goods to enemy countries." It is in these circumstances British firms engaged in foreign trade are warned that they must survey with great caution every opening for business which is offered them by neutral importers or exporters. Special care, it is said, should be taken in opening new accounts in neutral countries, and in relation to any orders or inquiries of an abnormal character. In fact, it is considered inadvisable that any new accounts should be opened by British traders in neutral countries during the war without the fullest inquiries as to the character of the business proposed. In the event of any doubt arising in the mind of a trader as to the *bona fides* of any particular consignee, the direction given by the Board of Trade is that business should be suspended pending reference of the matter to the War Trade Department, Central Buildings, Westminster, S.W.

## PERSONAL.

Mr. THOMAS BERRIDGE, J.P., of Leamington, has been elected to a seat on the Board of the Warwick Gas Company.

It is gratifying to see that Lieut. G. D. BIDWELL (whose misfortune in being wounded at the Dardanelles has already been intimated in the "JOURNAL"), though down with a bullet through his chest, has been able to write a post-card from the Deaconess Hospital, Alexandria. His chief regret seems to be having to lie quiet after such an active life as he has been having out there.

Among a number of rank and file gazetted Second-Lieutenants is FREDERICK BARTER, V.C., of the 3rd Battalion Royal Welsh Fusiliers, an employee of the Cardiff Gas Company. The award to him of the Victoria Cross, and the marks of appreciation of his gallant conduct bestowed upon him by the officials of the Company and his fellow workers were recorded in the "JOURNAL" for July 13, p. 88.

The Directors of the Chesham and District Gas Company have appointed Mr. FREDERICK J. ROBINSON as their Manager and Secretary. Mr. Robinson, who holds certificates in Gas Manufacture and Gas Supply, Chemistry, and Building Construction, served three years articles with Mr. George Lane, Assoc.M.Inst.C.E., the Manager of the Aylesbury Gas Company, and acted for a further period of four years as his Assistant. Since July, 1909, Mr. Robinson has been on the distribution staff of the South Suburban Gas Company at Lower Sydenham and Bromley. The annual make of gas at Chesham is 33 million cubic feet.

The retirement of Mr. W. D. CHILD from the position of Engineer and Manager of the Romford Gas Company, and his appointment as a Director, as already announced in the "JOURNAL," were referred to at the half-yearly meeting of the Company. The new Chairman (Mr. W. G. Wilshaw), in proposing a retiring allowance to Mr. Child, spoke of the good work he had done. He pointed out that the laying out and design of entirely new works were carried out by Mr. Child, who could look with pride to-day on the fruits of his work. He was glad to think that Mr. Child, though relinquishing the more active duties of management, would still retain a voice in it, and they would have the advantage on the Board of his technical knowledge and long experience of the district. Several shareholders spoke warmly of Mr. Child's splendid services to the Company; and both the proposed retiring allowance and his election to the Board were cordially confirmed.

## FIFTY YEARS AT SOUTH SHIELDS.

**Mr. J. H. Penney's Jubilee of Service with the Gas Company.**

CONGRATULATIONS to Mr. J. H. Penney, who has completed half-a-century's service with the South Shields Gas Company, during the last forty years of which he has occupied the position of Secretary. In commemoration of the event, and as a mark of their esteem, the Directors, on behalf of the Company, have presented him with a suitably inscribed silver salver and a cheque. The presentation was made by the Chairman (Mr. James Readhead, J.P.), at a Board meeting; and, in doing so, he expressed, in complimentary terms, the appreciation of the Directors of Mr. Penney's past services, and the hope that his health would permit of him continuing his work for some time to come. The Vice-Chairman (Mr. T. W. Wallis) endorsed these remarks.

Mr. Penney at an early age was, in August, 1865, appointed from among sixty applicants Collector to the South Shields Gas Company. Mr. Robert Wallis, J.P. (who subsequently completed over fifty years as a Director of the Company, and forty years as Chairman), was then Chairman, Mr. Wm. Anderson was Vice-Chairman, and Mr. Jonathan Nelson (a brother of Mr. Henry Nelson) was Secretary. The secretarial staff at that time consisted of the Secretary, a book-keeper, and one collector. After about twelve months, Mr. Penney was promoted to the position of Rental Clerk and Cashier; and subsequently, after the death of Mr. Nelson, he acted as assistant to the then Secretary, Mr. J. W. Lawson. Ten years after going to Shields, Mr. Penney was appointed Secretary—on the death of Mr. Lawson, in 1875.

The North of England Gas Managers' Association was formed at South Shields in 1877, when Mr. Warner, the then Engineer of the South Shields Gas Company, was made first President. Mr. Penney subsequently was appointed Auditor, and afterwards became a member of the Committee, then Vice-President, and in 1896 was President. He finally acted as Hon. Secretary and Treasurer of the Association for five years, a position which he filled with much credit. On relinquishing this position, the Association made him a handsome presentation, in recognition of his services.

When the Workmen's Compensation Act first came into operation, insurance companies, having no experience in this business, quoted very high premiums; and Mr. Penney took a prominent part, on behalf of the North of England Gas Managers' Association, in persuading gas companies in Durham, Northumberland, Cumberland, Westmorland, and Yorkshire to combine, with a view to jointly obtaining insurance at lower premiums. This was accomplished; and the precedent caused a very great annual saving to the gas industry in insurance premiums under the Act. Gas companies in various parts of England subsequently joined the scheme; and, by special request, Mr. Penney addressed the Gas Institute on the subject at Belfast in 1898.

Mr. Penney was for three years a member of the Committee of the Gas Institute. The minimizing of bad debts has always been a strong point with him—so much so, indeed, that he read a paper to the North of England Gas Managers' Association some years ago entitled "How to Minimize Bad Debts." The Company's bad debts last year only amounted to £104 on £110,229—equal to 1s. 10½d. per £100. In the past, Mr. Penney was often asked by directors and officials of gas companies to nominate candidates for official positions. He has always taken a great interest in training secretarial apprentices; many of them (Union British School boys) now holding excellent positions in various parts of England and abroad. In Jubilee Year (1887), a Royal Mining Engineering and Industrial Exhibition was held at Newcastle-upon-Tyne; and the Executive Council appointed Mr. Penney a member of the Gas Lighting Section Committee. He acted as Hon. Secretary for the section.

The following comparison of some of the chief items in the Company's receipts and expenditure in 1865 and last year indicates the growth of the business during Mr. Penney's service.

| | | 1865. | | 1915. |
|---|---|---|---|---|
| Receipts | Gas | £6852 | .. | £82,433 |
| | Tar | 464 | .. | 5,063 |
| | Coke | 505 | .. | 14,809 |
| Expenditure | Coals | £1949 | .. | £36,395 |
| | Rates and taxes | 331 | .. | 5,489 |
| | Wages | 1320 | .. | 26,293 |
| Total | Income | £8201 | .. | £110,234 |
| | Expenditure | 6032 | .. | 87,946 |
| | Profit | £2169 | .. | £22,288 |
| | Price of gas | 3s. 8d. | .. | 2s. 6d., less discounts varying from 7½ p. ct. to 20 p. ct. |
| | Dividend | 8 p. ct. | .. | 8½ p. ct. |

Mr. Penney's courteous and kindly disposition has endeared him to all who know him. He is a Freemason of long standing, and was W.M. of his Lodge many years ago. Three sons of his are now serving with the army.

# GAS ACTS FOR 1915.

[First Article.]

The review of the few Acts dealing with gas supply passed in the present session of Parliament will not be a very heavy task. There were no new or non-statutory companies applying for full parliamentary powers; and, as readers are aware, the amount of contest over the measures was not great—such variations as were made having been accomplished by quite pacific means. We shall only notice the principal alterations made since the Bills were reviewed, as in some cases it would merely mean a reproduction of the greater part of the information then supplied. It may be mentioned here, to save announcement in each case, that the clause inserted in the measures, at the instance of the Treasury, and relating to the raising of money during the war, is as follows:

> Notwithstanding anything in this Act, the Company shall not, under the powers of this Act, raise or borrow any money during the continuance of the present war and twelve months thereafter, unless the consent of the Treasury has been previously obtained.

Only nine Bills were promoted by statutory companies for extended powers; and they have all become law. The review of the Bills appeared on Jan. 5 last; and the particulars then supplied must be read in conjunction with those now published in regard to the Acts.

There is no essential change to record in respect of the Altrincham Gas Company's Act. But in connection with the calorific power clause, it is seen that the Company are, when required by a consumer at any time within two years after the commencement of the Act, to supply and fix free a sufficient number of flat-flame burners suitable for the consumption of gas of the prescribed calorific power in substitution for burners (not being incandescent ones) in use at the beginning of the Act. The Act is bulkier than the original Bill—the cause being the granting of protective clauses to the Cheshire Lines Committee, to the London and North-Western Railway Company and the Great Central and North-Western Railways Joint Committee, to the Cheshire County Council, and to the Urban District Councils of Altrincham, Hale, and Bowdon, and the Rural District Council of Bucklow. [*Parliamentary Agents: Messrs. Billing and Co.*]

The Ascot District Gas and Electricity Company's Act modifies in two or three particulars the proposals in the Bill as lodged. Power was originally asked to raise additional capital to the amount of £35,000 by the creation and issue of new ordinary or preference shares or stock; but in the result £50,000 was the sum allowed. The suggested clause providing for the suspension of the auction clauses during the period of five years from the date of the passing of the Act, or within such longer period as the Board of Trade might sanction, has been deleted. The idea was to give the Directors greater freedom in raising capital during the time of financial stringency owing to the money requirements for the war. It was also asked that the total amount of the borrowing powers should, with the sums already borrowed, aggregate £75,000, but that no sum should be borrowed in excess of an amount equal to three-fifths of the paid-up capital for the time being. What happened in this connection was that the £75,000 was altered to £70,000, and the three-fifths to one-half. So that this is a departure from the standard one-third; and the Company can make greater use of their credit in raising money. The other powers sought, as noted when reviewing the Bill, were granted. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Act of the Brighton and Hove Gas Company confers on them the territorial extensions sought; and the other powers desired. In connection with the two clauses granting power to make donations and subscriptions to institutions and funds, and to provide for benefits to employees and dependants of employees killed in, or dying as the result of, the war, it is now provided that the total amount of the payments to be made by the Directors out of the Company's funds and revenues, under these sections, is not to exceed a sum equal to ½d. per 1000 cubic feet of gas supplied during that year. Another clause gives power, in addition to forming a benefit fund under the Company's Act of 1912, to grant pensions and retiring or superannuation allowances to officers and servants (other than weekly servants). For this purpose, the total payments to be made in any year is not to exceed an amount equal to ½d. per 1000 cubic feet of gas supplied during that year. These are the only changes. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Ilfracombe Gas Company's Act is practically a reproduction of the Bill. This is the first measure that falls for notice with a level standard of 500 B.Th.U., instead of the model 540 B.Th.U. and the margin of 7½ per cent. Regarding the adoption of the sliding-scale, the proposed standard price has been lowered from 3s. 8d. to 3s. 6d. The electricity supply powers for Combe Martin, and all other suggested authorization noted when the Bill was reviewed, have been granted. [*Parliamentary Agents: Messrs. Lees and Co.*]

The powers contained in the Act of the Northwich Gas Company are an abbreviation of the proposals contained in the Bill. The new lands and works powers were withdrawn as a result of strong objection; but the extension of the limits of supply to the district of Weaverham has been secured. The Cheshire County Council have obtained protection, and so have the Cheshire Lines Committee. The even calorific power standard of 500 B.Th.U. has been allowed. The sliding-scale proposals have been expunged. All the other clauses remain, including those referring to the conversion of capital, additional capital, and borrowing powers. Introductions allude to purchase provisions in favour of the District Council. The power is exercisable by the Council in the next session of Parliament; and, upon the passing of the Purchase Act, the Council are within six months to give the Company the necessary notice of their intention to acquire the undertaking. Failing agreement, the purchase price is to be determined by arbitration. In addition to the purchase price, the Council are to pay to the Company the costs incidental to the obtaining of the Act, the watching or procuring of any amendment of the Bill to be introduced by the Council, and the sum of £200 in respect of the transfer of the undertaking and the winding-up of the Company. Compensation is also provided for the Directors, officers, and servants. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Ormskirk Gas Company have secured their proposed new land and works powers; and in regard thereto, the Act states, in the words of the Model Clause, but without the restriction incorporated in the model:

> The Company may also upon the said lands—
> (*a*) Work up and convert the residual products arising directly or indirectly from the manufacture of gas by them.
> (*b*) Purchase the residual products arising from the manufacture of gas by other gas undertakers; and therewith manufacture other products of the same kind as the Company are manufacturing from their own residual products.
> (*c*) Purchase from other gas undertakers and elsewhere, and use, the materials required to work up and convert the residual products so arising from their own manufacture of gas or purchased as aforesaid.
> But the Company shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the Company, or purchased from other gas undertakings, is merely subsidiary.

The calorific power clause has had the standard raised to 550 B.Th.U. from the model figure of 540 B.Th.U.; but the other conditions continue. We do not now notice the provision referring to exemption from penalty or forfeiture by reason of the presence in the gas of sulphur compounds other than sulphuretted hydrogen. The District Council of Lathom and Burscough have obtained a clause providing for the Company making certain main extensions within specified times, providing they can get the Treasury to sanction the raising of the necessary capital. A clause referring to future general legislation succeeds:

> This Act shall not, by reason only of the enactment of the provisions thereof, confer any exemption from any general legislation relating to the supply of gas which may be passed in this or any future session of Parliament; but the provisions of this section shall not be construed as preventing the conferring of any such exemption, or the enactment in any such general legislation of any special provisions relating to the undertaking of the Company.

The electricity powers for Aughton are granted; but purchase powers over the electricity concern, exercisable after ten years from the date when the Company commence to supply current, are conferred upon the West Lancashire Rural District Council. The capital and other powers conform with the proposals at the time the Bill was lodged. Protective clauses are accorded to the Lancashire County Council and the Lancashire and Yorkshire Railway Company. [*Parliamentary Agents: Messrs. Butterworth and Co.*]

In the Prescot Gas Company's Act, we have, in connection with the construction and maintenance of gas-works clause, the residuals clause contained in the Ormskirk Act, and as quoted *in extenso* in the foregoing notice of its provisions. The conversion of capital powers has been granted; but the additional capital powers have been reduced from £22,500 to £18,000. The borrowing powers are as proposed. In this case, the calorific power standard has been altered from the 540 B.Th.U., with 7½ per cent. margin, to the level standard of 500 B.Th.U., without margin. The pressure clause provides for 10-10ths; but as regards the parish of Knowsley 12-10ths is specified. Provision is also made for illuminating power testing, without forfeitures. The clause referring to the price to be charged for gas for public lighting seems to us to be too wide. After "consumer," the words "for lighting" should have been inserted. The clause reads:

> The price to be charged by the Company for gas supplied by them to any public lamps shall in no case be higher than the minimum charge for the time being made by the Company to any private consumer within the limits of supply.

In the provision exempting fittings on hire from being subject to distress, "dynamos" is mentioned. The maximum price of gas fixed by the Act of 1880 is repealed; and it is now provided that it shall not exceed 4s.:

> Provided always that, if payment be made on demand on the delivery of the quarterly account, or at the office of the Company within one month from such delivery, the Company shall make a deduction by way of discount of 10 per cent. on the price of gas so supplied.

Protection has been given to the Lancashire County Council, the Whiston Rural District Council, and the London and North-Western Railway Company. In the clauses in favour of the

Lancashire County Council, it is provided that for road-surface reinstatement work—

> The Company shall in respect of the area of the trench or excavation where the same is situate under the metalled surface of any road on demand pay to the County Council an amount calculated at the price or rate of 15s. per cubic yard for reinstating concrete foundation, 2s. 6d. per superficial yard for relaying pitch-grouted sett pavement, 2s. per superficial yard for relaying water bound macadam, and 3s. per superficial yard for reinstating tar macadam. Provided that, if the County Council make any delay in completing the reinstatement and making good of such road in accordance with this sub-section, the County Council shall indemnify the Company against all costs, charges, expenses, and penalties to which they may become liable by reason of such delay or failure.

There are no other variations in the Act as passed, that need be noticed. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Spennymoor and Tudhoe Gas Company have secured their land, capital, and borrowing powers, the marginless calorific standard of 500 B.Th.U., the right to supply dynamos among other apparatus, and, in short, all the powers sought by the Bill as deposited, and as noticed in our review of its main features. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Town of Warwick Gas Light Company are empowered, by their new Act, to drop the words "Town of" and "Light" from their title; so that "Warwick Gas Company" will henceforth be the correct designation. The new Act puts the Company on modern parliamentary terms. The general purposes clause, which originally proposed to give the Company power to purchase, manufacture, and deal in, residual products, now omits all direct reference to residuals, and states: "The Company shall continue to be, and shall be established, for the purpose of manufacturing and supplying gas for lighting, heating, and motive power, and other purposes within the limits of supply, and generally may carry on the business usually carried on by a gas company." Attached to the construction and maintenance of works clause are the residuals powers as conferred on the Ormskirk and Prescot Companies, as already noted. Regarding the conversion of the capital, there have been a couple of modifications. The existing shares are to be converted into ordinary 5 per cent. stock, to the amount of £50,000 (instead of as proposed £56,000), to be divided among the holders of existing shares in the proportion of £166 13s. 4d. (instead of £186 13s. 4d.), of ordinary stock for every £50 share in the original capital. The additional capital and borrowing powers are as in the Bill, except that the borrowing powers in respect of the ordinary stock into which the existing shares are to be converted are reduced to £16,666 (instead of £18,666). The lands and works clauses, and the provisions as to the purchase of the Barford Gas Company are intact—the maintenance of works clause including the residuals powers already referred to. All the other proposals, including the level 500 B.Th.U. calorific standard, are as alluded to in the notice of the Bill. Protective clauses have been given to the Lancashire County Council, the London and North-Western Railway Company, and the Great Western Railway Company. [*Parliamentary Agents: Messrs. Lees and Co.*]

## Photometric Work at the Charlottenburg Institute in 1914.

According to the report on work done last year at the Imperial Physical-Technical Institute (Reichsanstalt) at Charlottenburg, 74 Hefner lamps were examined and certified—making a total of 2153 Hefner lamps certified since the Institute undertook their verification in 1893. There were also examined for use as photometric standards 113 carbon filament and 261 metallic filament electric lamps. Previous experience has shown that carbon filament lamps are more suitable than metallic filament lamps for use as standards of light. Tests for durability or lighting power were made on four inverted gas-burners, and on various electric lamps. The four gas-burners were tested at pressures of 14·10ths and 20·10ths of an inch of water. The most favourable result from these inverted burners was 31·85 English candles (35·4 Hefners) mean lower hemispherical illuminating power per cubic foot of gas consumed. Durability tests of four "half-watt" electric lamps showed that the mean hemispherical illuminating power fell off by about 20 per cent. The consumption per English candle mean lower hemispherical illuminating power rose during the test from 0·50 watt to 0·61 watt.

**Lighting of Berlin.**—In their column of notes from German sources, the "Daily Telegraph" on Saturday last said that the "Deutsche Tageszeitung" gives some interesting details about the street and domestic lighting of Berlin. The total number of gas-jets in nightly use at the end of June was 34,754—showing a reduction of 2700 as compared with the corresponding period of last year. In the case of only 6489 has there been any reduction in the burning time. In the first half of 1915 there has been a reduction of 10 million cubic metres, or 6 per cent., in the quantity of gas produced at the Municipal gas-works. In addition to gas, the streets of Berlin were also illuminated by 42 petroleum lamps, 21 spirit lamps, and 1000 electric lamps of various sorts. Owing to the scarcity of petroleum, there has been a considerable increase in the number of automatic slot meters—no fewer than 34,582 new ones being installed in the first six months of this year. The number of slot meters in use on July 1 was more than 200,000.

# ELECTRICITY SUPPLY MEMORANDA.

Some heavy loans have been granted by the Treasury and Local Government Board to electricity supply undertakings in the industrial areas—loans considerably exceeding in amount anything sought by gas undertakings, the managements of which make the best possible use of their floating balances for the carrying-on of business as near to the customary methods as conditions over which they have no control will permit. It is notorious that relatively few electricity undertakings have anything in the way of floating balances; and many of them have no reserve, depreciation, or other such funds. They must be capital-fed up to the hilt. When the considerable loans sanctioned to municipal electric undertakings since the war commenced are compared with the comparatively small amounts of capital allowed by the Treasury to gas companies, it savours of greed for complaint to be made from the electrical side as to gas capital issues. "Fair Play," writing to the "Electrical Times,' has a growl on the subject. His fictitious name does not fit the growl. The cause of offence is that the South Metropolitan Gas Company have invited their consumers to subscribe for a further amount of capital; and this with the sanction of the Treasury. "Fair Play" wants to know whether the Treasury have imposed the same conditions upon company expenditure as they have done, through the London County Council, on London municipal electric undertakings. The reply is that they have; and if "Fair Play" had only acted up to his adopted name, and not been so short-sighted as to neglect inquiry, he would have found that the Treasury had very good reasons for allowing the South Metropolitan Gas Company to raise capital from their consumers. Perhaps he will consider this one point, that the amount of the Company's loan from their bankers stood at the end of June last at £360,000; and the new capital, if the Company's consumers have been so good as to take it up, will release part of this. Those people who adopt "Fair Play" as a *nom de plume* have not always the capacity for looking beyond their noses. Here, there was a circular from a gas company; the electrical man scented favouritism; and away he rushes into print in the "Electrical Times," and makes a stupid of himself. Even if favour in capital provision were shown to gas undertakings—they are not asking for favour, and do not expect it—no great complaint could be made, seeing that the more business they can get, and the more coal there is carbonized, the greater the source from which the industry can supply the country with those necessaries to the making of high explosives, and to accomplishing victory for this country and her Allies. We wonder whether "Fair Play" is one of the individuals who a time ago was screaming out "Gas must go." In these days, when English gas-works are doing so much to save the situation from the effects of a vast short-sightedness on the part of the Government and its red-taped bureaucracy, those individuals must recognize themselves as arrant fools.

**Capital for Competing Concerns.**

**An Equal Footing.**

The same individual asks: "Why not instruct the County Council to modify their attitude in restricting periods for loan repayments, so as to allow the electricity undertakings to compete with the companies and gas on an equal footing—the only fair and British way." If everything was removed that contributes to the putting of competition on an unequal footing between municipal electricity and private enterprise in gas supply, the result would be greatly in favour of the latter. Municipal electricity supply authorities would then not be allowed to fall back on the rates for making-up the deficits of mismanagement, or issuing from the conduct of business on lines that do not obtain in private business concerns. Electricity would not be allowed to be supplied at a price for one purpose at anything from (say) one-sixth to one-twelfth part that for which it is supplied for another purpose. Local authorities would have to put up to competition the lighting of the streets and public buildings, instead of as now tapping them as lucrative sources of revenue for their own electricity undertaking without caring a fig for the economy and efficiency for which, irrespective of the agent employed, the ratepayers are alone desirous of paying. There would also be a stop put to those acts of certain municipal departments which have for their object the promotion of applications for domestic electric lighting for roads in which cables are not laid; and then, on the strength of these applications—*bonâ fide*, remunerative, or otherwise—to get permission to lay cables and to convert street-lamps *en route* to electricity. Competing private gas enterprise, too, under the "equal-footing" competition scheme of "Fair Play," would not be called upon as a large ratepayer to contribute to the support of a trading rival. The irony of fate never had more freakish exemplification than this. In all the flights of Gilbertian imagination, a more grotesque position than this was never conceived. Yes, we agree whole-heartedly with "Fair Play" that the only fair and British way would be to put on a trading equality private gas enterprise and municipal electricity undertakings, by making the latter conform with business principles and be conducted in the same manner that a private individual or private company would do his or their business to earn a profit on the capital in-

volved, and to obtain some reward for the exercise of brains and skill.

**On "Higher Grounds."**

While on this subject of competition on equal footing which "Fair Play" so much desires, we should like to ask the "Electrician" why it is so shy about discussing the question of the Northumberland clause from the points of view of the ratepayer and of private competing enterprise. We gave our contemporary material for dilating upon these points in the "Memoranda" in the "JOURNAL" for July 27; but it prefers to deal with the subject on the same old lines, and to expose to view again and again the same old arguments. However, we will have another try to bring our contemporary to a public consideration of the matter from the standpoints of justice to the ratepayers and to private competing enterprise. We do so now with a fair amount of assurance that it will comply. The assurance arises from the fact that, after referring in its last utterances on the subject, to what it regards as the difficulty of applying the Northumberland clause to a small section of a big electricity supply concern, it says that it is opposed to the principle of the clause on "other and higher grounds." When one finds a man who is willing to consider a controversial question on the "higher grounds," it may be taken that his sense of justice will permit his survey to be of a very complete character. One of the "higher grounds" upon which our contemporary pitches its arguments is that "no unfair check or hindrance should be placed upon it [the municipal electricity undertaking] in its endeavours to perform its public obligations." That is good. Will our contemporary tell us why any "unfair check or hindrance" should be placed on a fully assessed and rate-loaded private gas enterprise by reason of a municipal electricity department being, in the name of so-called progress, carried on in a manner to increase the rate-paying burden falling upon the rival enterprise? The greater this burden, the greater the "check and hindrance" to the progress of private gas enterprise. "Unfairness" forsooth! The term lies in the mouths of some electrical people with the same appropriateness as the protest of the burglar against the injustice of conviction and sentence, when awarded "six months' hard" for breaking open a refrigerator which he had mistaken for a safe. "Unfairness!" The competitive methods of some municipal electricity concerns are well enough known. The illegal preferential terms, the trade slanders, and the attempts made, through the dominating position of the local governing body, to crush the life out of private gas enterprise, are not electrically regarded as "unfair checks and hindrances" on the gas industry. The gas industry has its own opinions in regard thereto. The "Electrician" should carry out to the full its purpose of considering this matter upon "higher grounds." Then it would see that the Northumberland clause is not intended "as a check upon competition and upon progress," but it is the nearest approach to which one can get in compelling municipal electrical traders to conduct their business on the lines that private enterprise has to pursue if it does not desire to consummate its career in a Bankruptcy Court. The fairest competition is when a gas company and an electricity company are the opposing commercial forces, out to make fair profit and reward, but with no rate-backing, nor the inducements to a looseness of management that municipal trading harbours. They are on equal terms. But in the other case, the stronger the competition from private gas enterprise, the greater the proneness of the municipal opponents to indulge in applying the screw of uncommercial and unfair practices. Why municipal undertakings should be pampered in the early years of their running any more than a gas or electricity company, we cannot for the life of us tell. When the "Electrician" started, it did so to make way, or collapse in the attempt, without any support but that afforded by private money and brains. It started without any statutory power to abuse ordinary trading principles; and it is with us to-day. By the way, we put before our contemporary, in our issue for July 27, an illustration in relation to this matter. If it will discuss this, it may help it to view things broadly and fairly from the "higher grounds" of this particular question.

**The Crude Light and External Refinement.**

Electric lamp and lighting developments in the near past and future is the subject of some articles contributed to the "Electrical Review," by Mr. L. Crouch. There is nothing to which exception can be taken in the first article Mr. Crouch does not claim for electric-lamps a merit without defect; but his main purpose appears to be to see how something better can be evolved from the crude lights electrically generated. Whether the light be obtained by an electric arc or whether it is developed by filaments raised to incandescence by very high temperatures, one can only look upon the resulting harsh, eye-injuring, intrinsic brilliancy as something that is very crude, and wants refining by external means before being brought into use. However, Mr. Crouch thinks it would be a great pity if advantage were not taken of the present opportunity of suppressed public lighting to investigate carefully the best polar distribution for street lighting—more particularly with regard to the use of new types of globes and reflectors. The old system of street lighting was often crude; and therefore it is thought that steps should be taken to see if permanent good cannot be evolved from present evil. It is also hoped by the writer that, after the war, there will be proper control of privately owned lamps and signs on the exterior of buildings. The hope has our hearty sympathy. But poor hard-pressed architect! Things are running at such a pace now that in every element of a building, he is expected to arrange for things upon the "scientific" lines laid down by the specialist. Now we have Mr. Crouch a warm advocate for insisting on architects making some provision for the "harmonious accommodation" of electric signs when designing buildings on which it is certain they will be used. We do not know who is to have the power of "insisting," save the person who pays for the building; and outside signs generally find application just where use was never premeditated. As to domestic and other small unit lamps, Mr. Crouch says: "Agreed as we all are on the desirability of low intrinsic brilliancy in luminous sources, it is curious that we seem to get farther away from our ideal." If Mr. Crouch will work backwards in the order of intrinsic brilliancy of lighting agents, he will leave the electric filament lamps and come to the comparatively low intrinsic brilliancy inverted incandescent gas-lamps, with a bearable intrinsic brilliancy. Looking on the high intrinsic brilliancy electric filament lamps as an "intolerable" source of light, the contributor points out the importance and necessity of making the light tolerable by means of reflectors, refractors, and diffusers. There is a nasty smack at illuminating engineers. Mr. Crouch thinks that "scientific" precepts have been carried too far in illuminating work. "Many of the rules and methods advanced encourage a false sense of security, and are apt to give very disappointing results when applied by 'illuminating engineers' of limited experience and great faith." Mr. Crouch will be losing some of his friends if he lets himself go in this unrestrained fashion.

**The Arc Lamp Maker and "Half-Watts."**

We have been recently reminded by the "Electrician" that little is now heard of arc lamp development. If the war does not hasten to an end, arc lamps will before long almost have vanished from useful existence. They are only seen now shaded and hooded as though utterly ashamed of themselves. This is, of course, by order; and owing to the scarcity of carbons and labour, street-lighting authorities, with these expensive sources of illumination in the streets, are scrapping them, and putting in "half-watts," which do not require so much labour, nor ask to be periodically fed with carbons. But notwithstanding the exodus of the arc lamp through a combination of misfortunes, our contemporary suggests that the arc lamp makers are not likely to relinquish their hitherto lucrative businesses without a big struggle. We do not suppose they will; on the contrary, the lamp that is deposing their wares ought to act as an incentive to attempts to improve the latter. There is the difficulty that past improvement in efficiency with the arc lamp has brought in its train increased troubles and increased costs for labour and maintenance. The flame arc lamp enhanced efficiency; the fumes and *débris* from the carbons soon discounted the efficiency. The fumes, too, acted deleteriously upon the metal parts of the lamps. Frequent cleaning, adjustment, and repair were in consequence necessary. Costs increased apart from current and carbons. The magazine lamps had some effect in reducing lamp labour. But there again mechanical devices had not a comfortable home in the heads of the lamps; and they brought their debits to set against the credit of reduced labour. There is room for much improvement; but how to achieve it is not an easy matter. However, the "Electrician" appears to be more optimistic than the members of the arc-lamp trade; for it thinks the interruption in business will afford a unique opportunity for the arc lamp specialists to investigate the properties of salted metal electrodes, and to arrange for their production on a commercial scale. Our contemporary appears to be filled with the belief that this is the road to salvation for the depressed arc lamp makers. If they neglect it, well then they may take it that their industry, by the time the end of the war comes, will be practically defunct. The arc lamp makers know full well there are other things besides the development of carbons which must claim attention, through the new competition set up against them by "half-watts."

**New Carbons.**

The incident inspiring the views of the "Electrician" on the subject of what the arc lamp makers must do if they do not want to prematurely shuffle off these mortal coils, appears to have been the arrival of the intelligence that Messrs. F. Lewis and H. G. Hatfield have developed new salted carbons for arc lamps, known as the "Crusta," and made by a German firm. Briefly described, the positive carbons consist of a tube of homogeneous carbon, surrounded by a jacket, formed of a mixture of salts, containing fluoride of calcium, tungstate of sodium, and chromate of potassium. It is claimed that the jacket of salts causes the rate at which the carbon burns away to be extremely slow. The arc lamp makers, if they are in a position to adopt the new carbons, will hope this is so. As to the negative carbon, this is an ordinary homogeneous cored one; the composition of the core only departing slightly from the normal. Among the asserted merits of the carbons are that the arc burns quietly; that there is an enhanced lighting effect, produced mainly by the formation of a coating on the ends of the carbons, which are readily moistened by the molten illuminating salts, so that the latter are fed thereto in ample quantity; and that there is no accumulation of residues from the salts during burning. But the carbons must be used in a vertical position to obtain these results. This shows that they are not applicable to all types of lamps—in fact, a special lamp for them has been constructed, also in Germany. This lamp, it

is stated, will run forty to fifty hours with one pair of carbons, at an efficiency of 0·14 watt per hefner unit with continuous current, including losses in the resistance.

**"Half Watt" Behaviour.**

"Electrical Engineering" has drawn attention to an article by Dr. K. Mey, of the A.E.G., of Berlin, on the behaviour of half-watt lamps. The behaviour is about what might be expected of anything possessing modern developed German characteristics. The filaments of these lamps, it is pointed out, require more energy to bring them to the same temperature in nitrogen as *in vacuo*, so that the better efficiency is only attained by using a much higher temperature. The filament burns out, however, owing to rapid vaporization, unless it is spiralized or arranged in some other way to occupy only a small space, so as to limit its capacity for giving off heat to the gas, when only a moderate increase in temperature is necessary to make up for the loss of heat. It is found that the permissible rise in temperature corresponds to a lamp efficiency of 0·65 watt per mean spherical Hefner unit. [We wonder why our electrical contemporaries persist in calling a Hefner unit Hefner candle power.] A 110-volt Hefner unit lamp has a filament spiral about 145 mm. long and 0·62 mm. diameter, and emits 10·7 Hefners per sq. mm. of surface, and the gas in it is at two-thirds atmospheric pressure. The efficiency based on the mean hemispherical candle power (without lantern or reflector) is said to be 0·5 watt per Hefner unit; and it is estimated that the loss of about 7 per cent. by obscuring the globe is approximately compensated for by using an outside reflector. A curve in the article shows the dependency of candle power and efficiency on voltage; and it appears that the variation is in about the same proportion as that of an ordinary tungsten lamp. A 5 per cent. drop in voltage reduces the candle power by roughly 15 per cent.; but the wattage per candle only increases from 0·5 to 0·55. A 5 per cent. increase in voltage sends the candle power up about 20 per cent., and reduces the wattage per candle to about 0·45. But what about life? At 10 per cent. below normal voltage, the candle power is still nearly 75 per cent. of the normal; and the wattage per candle power about 0·62.

**German Truth as to "Half-Watts."**

Our electrical friends cannot long continue to maintain the hollow pretence that the "half-watt" lamp in performance justifies its cognomen. We have lately seen that Dr. Ives and other scientific men will not subscribe to the deception. They prefer the description of "nitrogen filled lamps." We are not in the habit of applying to Germany for truth in these days; but an advertisement in the "Electrotechnische Zeitschrift" does get nearer actuality than the "half-watt" advertisements in our home electrical papers. The German advertisement gives a list of lamps for 100 to 130 and for 200 to 250 voltages. Both mean spherical and horizontal candle powers are given for the lamps. In no case does the former reach ½ watt per Hefner unit (0·9 candle power); and the horizontal power only reaches ½ watt per Hefner in the larger sizes. The 150-watt 100-volt lamp has a horizontal power of 240 Hefners, and the 200-volt lamp of the same wattage only 200 Hefners—*i.e.*, 0·75 watt per Hefner. This has better approximation with the photometrical tests made in this country than has the pseudo appellation with which this class of lamps has been endowed.

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**The Late Mr. Edward Allen.**—The current number of the "Journal des Usines à Gaz" contains a reference to the late Mr. Edward Allen, who, as President of the Institution of Gas Engineers, was an honorary member of the Société Technique du Gaz en France. The writer of the paragraph speaks of him as an accomplished "gentleman" (using the English word), who was highly considered by all his colleagues. He was at the head of an important Company in which he had risen by successive steps till he reached the high position which he deservedly filled by reason of his works; and he was also a member of the Government Commission on Explosives. His removal by death has caused general regret; and our contemporary expresses deep sympathy with the Institution of Gas Engineers in the loss they have sustained. The September "Bulletin" of the British Commercial Gas Association also opens with sympathetic reference to Mr. Allen's death, over the initials "F. W. G." It is pointed out that from the earliest inception of the movement he was an ardent supporter of the Association, and that on the Executive and General Committees he "gave wise and valued counsel with that modesty and that amiability which were two of his most marked characteristics. As President, from June to October, 1913—a period which included the Second Annual Conference, opened in the historic Guildhall of London by the Lord Mayor, and concluded at the National Gas Congress and Exhibition—Mr. Allen showed at his very best; and in moving and carrying the resolution altering the rules, as a result of which he vacated the presidential chair after only four months' tenure, so that it might in the future be occupied by a President elected by the Association instead of automatically being filled by the President of the Institution, he exhibited at once the unselfishness and the statesmanlike attitude which marked his every act. In the organization and the carrying through of the Jubilee-Centenary Exhibition, Mr. Allen, as Chairman of the General Committee, gave thought and work without stint, and with unbounded enthusiasm."

## THE GAS CHEMISTS' SUMMARY, 1914.*

Reviewed by J. T. Sheard, F.C.S.

When Mr. Hendrickson first essayed to summarize the periodical literature of gas chemistry a year ago, it was my privilege to commend the book to "Journal" readers. Another volume, dealing with the literature of 1914, is to hand. In its compilation the author has adhered to the plan of the former work; an epitomized rendering of the several communications dealt with being strung together into a connected narrative arranged under suitable headings. While the number of separate papers or other publications analyzed remains about the same as last year, the book itself has expanded from 123 to 167 pages. Is it a sign of increasing attention being paid to chemical technology that the enlargement of the book is chiefly noticeable in those chapters which are concerned with the more strictly chemical subjects?

It is unnecessary for me, especially after what I wrote on the subject a year ago, to enter upon an analysis of the contents of the volume, which would be to review the gas literature of two Continents throughout a whole year. It must suffice to say that, after a careful perusal, I have nothing but praise for the book. It fulfils a useful purpose in gathering together, and enabling easy reference to be made to, much valuable information which is liable to get forgotten after a brief spell of publicity in current periodicals. A very complete index, and a system of indicating the subject-matter by means of heavier type in the text, both contribute to this end; while an extensive bibliography enables the reader to follow up the subject at greater length if it is desired. A few typographical errors, which will not, however, cause the reader much confusion, are the only imperfections in a useful and excellent book, for which there should be an ever-increasing demand.

* The Gas Chemists' Summary, 1914. By A. V. Hendrickson, F.C.S. London: Walter King; 1915. Price, 3s. 6d.

## COAL OUTPUT IN 1914.

The first of the four parts into which the Home Office report on Mines and Quarries for 1914 is divided was issued last week, and furnishes in summarized form certain information which will be available in more detail in Part III. Mr. R. A. S. Redmayne, Chief Inspector of Mines, signs the present Blue-Book, which deals with divisional statistics.

It is stated in the report that in the year 1914 the total output of coal in the United Kingdom from mines under the Coal Mines Act was 265,643,030 tons. Adding to this 21,363 tons from open quarries, the total output of coal was 265,664,393 tons. This is a decrease of 21,766,080 tons on the output of the previous year, which was 27,014,135 tons more than the figure for 1912, when the national coal strike took place. The decrease in 1914 of the coal production in the several inspection divisions, as compared with the output for the year before [including the small quantities obtained from quarries], is shown to be as follows: Scotland, 3,609,154 tons; Northern coalfield, 6,291,149 tons; York and North-Midland division, 6,140,697 tons; Lancashire, North Wales, and Ireland, 1,920,959 tons; South Wales, 2,950,565 tons; and the Midland and Southern coalfield, 853,556 tons.

Last year, in view of the heavy depletion of mine labour due to recruiting in the final months of the year, owners of mines under the Coal Mines Act were asked to return both the number of persons ordinarily employed during the period from January to July, and the number that were employed on the last pay-day in December. It appears from the replies sent in that for the period from January to July the number of persons ordinarily employed at the 2988 mines under the Act was 1,133,746; but that on the last pay-day in December, 1914, the number actually employed had fallen to 981,264. Of the larger figure of 1,133,746, there were 915,381, or 80·7 per cent., employed below ground.

At the mines working under the Act, there were 1182 separate fatal accidents, causing 1219 deaths. Compared with 1913, this was a decrease of 38 in the number of accidents, and of 534 in the number of deaths. The total number of non-fatal accidents occurring during the year which disabled for more than seven days was 158,541; the number of persons injured being 158,862. The death-rate from accidents of the underground workers, last year, at the mines under the Coal Mines Act—calculated on the number of persons ordinarily employed during the period from January to July, 1914—was 1·19 per 1000 persons employed, as against 1·74 in 1913; the death-rate of the surface-workers, on the same basis, being 0·61 per 1000, as compared with 0·79 in the previous year. The figure for the two classes of workers taken together was 1·08 per 1000 (against 1·55 in 1913), being the lowest on record for the United Kingdom.

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The September issue of "A Thousand-and-One Uses for Gas," a copy of which has been received from the British Commercial Gas Association, contains a number of illustrations; and, being a "Domestic Hot-Water Number," there are to be found in it special articles dealing with a branch of gas supply which is daily increasing in importance.

# WIDENING THE FIELD OF RADIANT HEAT DISTRIBUTION.

### Richmond "R.H.D." Fires—An Innovation.

DEVELOPMENT in ideas usually precedes material progress—the one inducing research with the view of attaining the other. Of late years there has been a considerable aggregate improvement in connection with gas-fires. Radiant efficiency in relation to the heat generated by the combustion of the gas has ascended by leaps and bounds, until we have reached something that looks like being within measurable distance of the maximum. Gas-fires have been rendered silent in use, or practically so. They are tabooed to-day unless hygienically perfect. Form and design have been enhanced, so that there is not the ugly mass of surrounding heat-absorbing ironwork, which detracts from radiant efficiency, and increases the convected heat. The improvement of form and design, and an appreciation of the essential as to the fitness of a gas-fire to environment, have rendered the gaseous method of heating suitable for any apartment, whether exquisitely or modestly furnished.

#### RADIANT EFFICIENCY AND THE FACTOR OF DISTRIBUTION.

In the development of gas-fires, however, the greatest attention has been given to the production of the highest radiant efficiency. What is radiant efficiency? It has been construed as the yield as radiant heat of the largest possible percentage of B.Th.U. generated by the combustion of the gas; but radiant efficiency has not hitherto taken into account, as it should do, the factor of distribution. The heat radiations from the gas-fire, travelling in straight lines, have been delivered to a room in bulk so to speak; in other words, the field of distribution has been comparatively narrow. The result of this is that only the solid bodies within this limited field of distribution are heated up, and then part (as is proper) with their low-temperature heat to the air of the room. In view of the narrowness of the field within which the radiations operate, there cannot possibly be equality in the warming-up of the walls, furniture, and other bodies in a room; and therefore room-heating efficiency is not of the high standard which would result if a better distribution were effected. A greater perfection is worth attaining; and if by the widening of the field of distribution, a better diffusion of the radiations can be obtained, further progress in scientific heating will be realized. What is wanted is that the radiations shall be directed to every quarter of a room—penetrating to the walls and corners, or coming in contact with the solid bodies, in all parts. It cannot be claimed that this is accomplished with any flat-faced or bow-fronted fire, situated on one side of a room—no matter whether the fire be fed with solid or gaseous fuel. But the gaseous fuel fire lends itself better than others to attempts to secure greater diffusion of the radiant heat developed.

#### THE RICHMOND SEMI-CIRCULAR FRONTED FIRE—INCREASED RADIANT EFFICIENCY.

The Richmond Gas Stove and Meter Company, Limited, have been at work upon this subject; and they have produced a fire—the "Radiant Heat Distributor" (or "R.H.D.") gas-fire—which opens out the field of radiant heat distribution like a fully expanded fan. In other words, by constructing the front of the fire so that the vertical radiants are disposed in semi-circular form, instead of being in a straight line, radiant-heat distribution is successfully effected to all parts of the room.

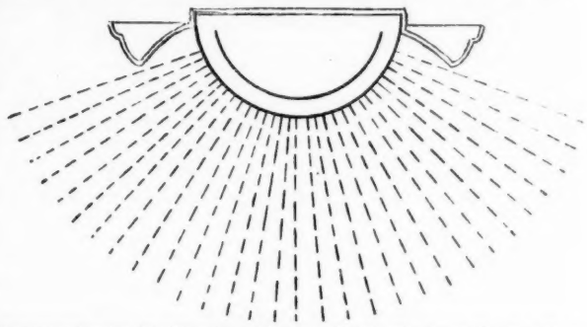
This improved distribution is the objective of the Richmond Company in developing their new fire; but the lines of development have been accompanied by other gains. The old heavy proportion of convected heat and the flue heat have been the two sources from which there has been recovered by modern practice a greater proportion of heat as radiant energy; but a largely unexplored source of loss of heat which helps to swell the chimney heat is the cast-iron back of the fire. A diminution of the loss from the back of the fire would automatically produce an increment—although not an equal increment—in the radiant heat emitted by the fire. The reduction of this source of loss is therefore a matter of structural revision; and this revision is accomplished, and a decreased area of back casting obtained, by the new "R.H.D." fire of the Richmond Company, with its semi-circular front, for which construction as a whole patent protection has been applied for. When it is mentioned that the area of the back brick, and the amount of rear heat loss have been reduced by 33 per cent., it will be admitted that something has been achieved here. The radiant efficiency of the Richmond fires has been up to the best of standards for many years; and an improvement has now been effected by this means, and, as will be seen later, by the use of nickel reflectors, which prevent the absorption of a certain proportion of heat by the adjacent cast-iron work. The firm assert that, as a matter of fact, the new fire has a radiant efficiency very much greater than any of its predecessors, high as has been the standard to which they have worked.

#### OTHER STRUCTURAL FEATURES.

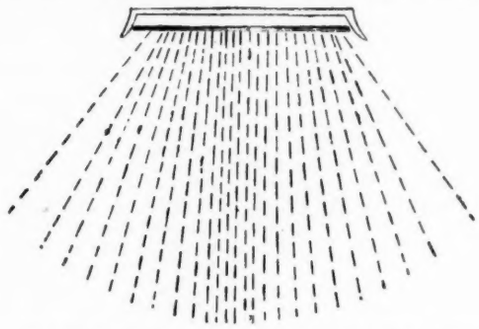
Among other structural points of the "R.H.D." fire, it may be mentioned that the special half-circle burner is fitted with the firm's patent gas and air adjuster, which, under all ordinary conditions, ensures silence in burning. Although this adjuster has been described before, readers may be reminded that the injector has been designed so that the gas flows out from the jet at a number of points on the circumference of a circle, and thus gives a cylindrical stream of gas, which, as it passes into the burner tube, steadily expands. The head of the controlling spindle, which is about $\frac{3}{8}$ inch in length, is provided with a number of carefully cut and graded serrations. The spindle works in a collar of definite length; and, by screwing it forward, the gas supply may be gradually shut off. Thus, it will be seen that, prior to its exit from the fitting, the gas passes down a number of short tubes, and in this way all objectionable eddy currents in the stream of gas are eliminated, and consequently noise. By suitable adjustment of the various parts of the fitting, the velocity of the issuing gases is reduced sufficiently to prevent the formation of the eddy currents; and yet there is induced sufficient primary air into the burner by means of the gas stream to enable the fitting to work satisfactorily at the varying pressures, and with the varying composition, of gas supplied in different towns. The semi-circular fire-brick back has a cavity in it forming an air pad, as has been the practice of the firm of late with their ordinary fires.

Another structural point is that, in the construction of the canopy and flue, Richmond's well-known "ledge" principle has been applied.

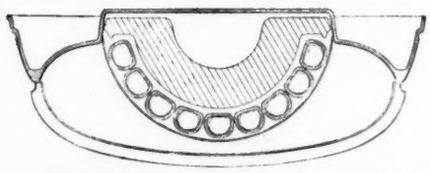
A further feature is that the fire is fitted with nickel reflectors at each side on the fender, and on the ledge of the canopy. The purpose of these is satisfactorily accomplished. It is to prevent



**Representing the Distribution of Heat emitted by the Semi-Circular Fire.**



**Representing the Distribution of Heat emitted by a Flat-Fronted Fire.**



**Showing the Reduced Area of the Back Brick compared with the Radiating Surface.**

the absorption of heat from the radiants by the extreme sides and canopy of the fire, and deflect it out into the room. We are assured that the nickel used is non-oxidizable, and will not deteriorate; and that it is capable of reflecting 90 per cent. of the infra-red radiation. The firm direct special attention to the reflector on the canopy ledge. The radiant heat from the fuel hitherto absorbed by the cast-iron canopy must be an appreciable amount; and this passes away as flue loss and as convected heat. The reflectors prevent the canopy from becoming a means of drawing-off heat by absorption and dispersion; and so in this way radiant efficiency is again subserved by the structural arrangements. Indeed, the reflectors have a triple advantage. There is the one just mentioned. Then, when the fire is alight, the reflectors considerably enhance the appearance of the fire by the optical effect produced of a large increase in the radiating surface. When not in use, the polished reflectors add to the appearance of the stove—being both an ornament and a refinement.

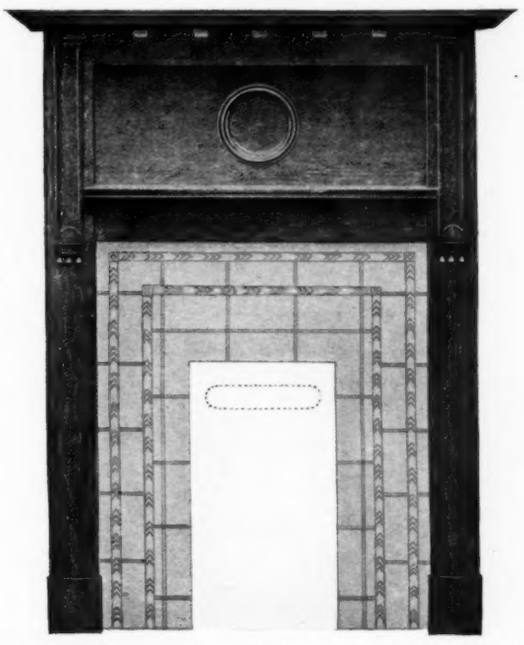
#### DIFFUSED VENTILATION.

While no one pretends that a gas-fire alone provides adequate ventilation for a room, it is a considerable aid to the changing of the atmosphere, and, as it happens, at the period of the year when rooms are more freely occupied than at other seasons, and when there is a proneness to keep doors and windows tightly

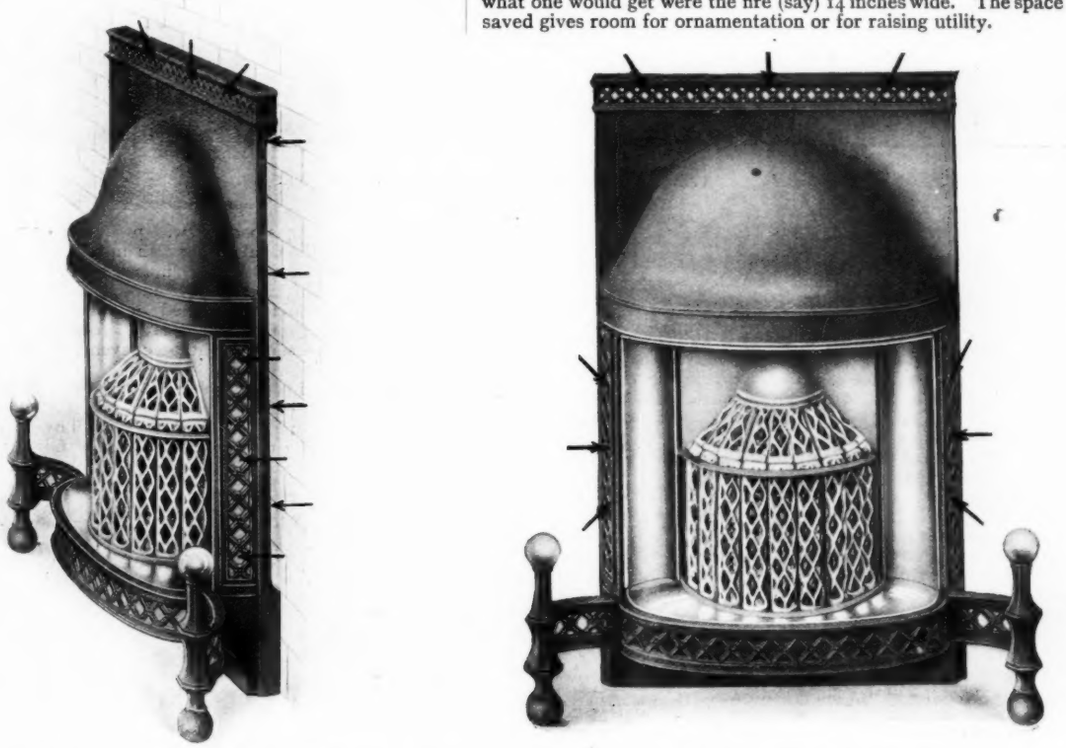
closed. The Richmond Gas Stove and Meter Company have been giving attention to the subject of improving their fires as means of ventilation. In dealing with the raising of the ventilating capacity of their fires, they inform us that they have acted on the same principle as in respect to radiant heat—viz., distribution and diffusion. They contend that just as it is desirable for radiation to be distributed over a wide area, so it is desirable for the room air to be drawn for ventilation from a wide area—in other words, it is their view that a single stream or current of air drawn from one position and passed through a restricted orifice is akin in principle to the flat-fronted fire giving all its radiant heat to a limited area. Of course, this is a point that is open to controversy, seeing that radiations are confined to straight lines; while where there is rapid withdrawal of air from a room, fresh air must be finding inlet at various points, and so the air of the room is not by any means stationary. However, this does not detract from the principle that numerous air-ports must be an advantage, if only their provision is not detrimental in any other way. That the new fire does provide numerous air-ports through which air constantly streams is shown by one of the accompanying illustrations. The points of advantage submitted are: The air change is ample; the air-ports having been made to suit the usual area of the chimney shaft. Further, the air is entirely drawn through the cooler parts of the iron frame of the stove, and not the hottest portions—cool parts which are protected from the heat by the nickel reflectors previously described. Where the fire is fixed in front of a standard coal grate, it is apparent how the ventilation is effected. Where it is desired to build-in the fire, or fix it flat against the tiled slab, one of the photographic reproductions shows how the firm recommend it should be fitted. The large open space left in the tiling is the same as, or greater than, the area of the chimney outlet. It is obviously unnecessary, and it is a waste, to tile the area covered by the back of the fire. The spacing of the air-ports, it is pointed out, avoids any excessive "pulling" in one direction; and it also ensures that cold draughts will not be produced to interfere with the comfort of the occupants of the room.

### Impressions.

We have inspected a sample of the fire; and the first impression is that the design has been admirably chosen to enable the ventilating to be accomplished without in any way detracting from the artistic appearance of the fire. The fire is of "Chippendale" design, and is in harmony with the firm's popular "Period" series of fires. It is something quite out of the ordinary rut. At whatever point one is sitting—a distance away at the side of the fire, or right in front—one looks at a solid cheerful incandescent fire. One cannot get the same effect with a straight faced fire, with which only the persons who sit quite in front realize the full effect. But this fire distributes its benefits and its comfort equably, without reference to the position occupied by a person. There are, too, compactness and finish about the fire, which are pleasing features. But words only inadequately describe visual presentment. The illustrations do this much better; and there can only be one result of their examination—appreciation of this branching-out into a new line of construction, with its accompanying merits. Another impression is that the fire will have a large adaptability for all sizes of rooms; seeing that, although the accommodation may be limited for the installation, a powerful fire can be supplied under this form of construction. We have spoken of the narrow fire back. The fire-brick back of the fire inspected did not appear to be any greater than one would have in an ordinary 10-inch fire, and yet, if the radiants in the fire were placed in a straight line, they would give a surface equal to what one would get were the fire (say) 14 inches wide. The space saved gives room for ornamentation or for raising utility.



**Showing Opening in Tiled Back, as Recommended to Secure Ventilation.**



**SIDE AND FRONT VIEWS OF THE FIRE, SHOWING THE NUMEROUS AIR-PORTS FOR VENTILATION.**

There is just one point about the name—the "R.H.D." fire. It has a double appropriateness. The three letters give us the initial letter and the final letters of the two syllables of the firm's name (RicHmonD). The three letters are also the initials of the three words constituting the full name with which the fire has been endowed, and which it clearly merits—the "Radiant Heat Distributor."

# WESTON-SUPER-MARE NEW GAS-WORKS.

To cope with ever-increasing business, the plant of the Weston-super-Mare Gaslight Company has been altered, extended, and renewed many times. In 1904-5, in order to provide additional manufacturing plant, consideration was given by the Directors and the then Manager, Mr. J. H. Gray (who has since retired, and was succeeded only this year by Mr. James Taylor, of Mossley), to the process for the production of carburetted water gas, and plant was installed which has been in operation ever since with considerable benefit to the Company. The output continued to grow; and in 1911 the Board approached Messrs. Corbet Woodall and Son, of Westminster, and asked them to report upon the question of adopting improved machinery at the works, and for a scheme to provide for the development of the works rendered necessary by the large annual increase in the demand for gas. As a result of their advice, the Board decided to provide an entirely new works in order to obtain the fullest possible benefit from the adoption of modern machinery, working under suitably arranged conditions. It was found that any scheme of reconstruction of the old works would have to be of the most drastic character; and the expense involved would not be justified by the results which could be obtained. Land adjoining the existing works was purchased; and sufficient area was provided to be ample for any developments during the next fifty years. The total area of the land on which the works are situated amounts to 15½ acres, all of which is the freehold property of the Company. The following particulars of both the old and the new works are taken from a descriptive pamphlet which has been prepared for distribution among the proprietors.

VIEW OF THE NEW WORKS FROM THE WEST.

## THE OLD WORKS.

These works consisted of three retort-houses with adjacent coal-stores, air-cooled condensers, exhausters, washers, purifiers, &c.; the whole being capable of producing 732,000 cubic feet of coal gas per 24 hours. The retort-settings in the two smaller retort-houses are being demolished; but the larger house, which is capable of producing 448,000 cubic feet per day, together with the necessary condensing, washing, purifying, &c., plant, is at present being retained in working condition. The whole of the retorts were contained in direct-fired settings, operated by manual labour. All coal used was carted from a short private railway siding inside the works to the coal-stores or retort-houses.

The carburetted water-gas plant consists of two sets of generators, carburettors, superheaters, &c., and is capable of a maximum daily production of 700,000 cubic feet of gas. The gas-making vessels are used alternately; one set always being in reserve for stand-by purposes.

The present sulphate of ammonia plant was installed 23 years ago, and is now quite inadequate for dealing with the increased production of ammoniacal liquor. Plant capable of producing 3 tons of sulphate of ammonia per day is on order, and will replace the existing plant in the course of a few weeks.

There are five gasholders; the total storage available for distribution being 1,898,300 cubic feet.

The governor-house contains two 18-inch station-governors, which are of the compensating type, and are water-loaded. These are used for regulating the pressure of gas given by the gasholders to the amounts requisite for the supply to the district mains. A "safety" governor is also provided to guard against any failure of supply to the town due to inadvertence or negligence of the attendants in the regulation of the gasholder valves.

## THE NEW WORKS.

Messrs. Corbet Woodall and Son were engaged as Consulting Engineers, and instructed to prepare a scheme for the new works. The scheme provided for works capable of producing 1 million cubic feet of coal gas per day, with provision for extensions which would increase the total output to 2 millions. Much of the plant provided for would, in fact, be suitable for the larger output which the Consulting Engineers had in mind; and, therefore, the additional capacity could be obtained for a comparatively low outlay. Plans for utilizing the remaining land were also considered, so that still further extensions might be conveniently made should they be needed at a future time.

The site proved to be a somewhat difficult one for the exacting requirements of a modern gas-making plant, as, in addition to the surface of the ground having to be raised all over the site by about 3 feet, necessitating thousands of loads of filling material being used, special care had to be taken to provide satisfactory foundations for the great weights of some of the structures.

Gas was first made at the new works on June 8 of this year; and the old and new works were operated together until June 16, when the old works were closed-down. All the coal gas required since that date has been provided from the new works.

### Railway Siding.

For the conveyance of coal and other materials, a line of railway is laid from the old works, connecting with the Great Western Railway system; the total length of this siding being 465 yards. At present the railway waggons are hauled to and fro by horses; but as soon as the amount of traffic will warrant the expense, mechanical haulage will be substituted.

### Coal-Handling Plant.

The coal-waggons, on arrival at the new works, are emptied into a receiving hopper placed underneath the rails, from which hopper the coal is automatically fed into a gravity bucket conveyor. This conveyor has two changes of direction, and is fitted with a tipping device which empties the load from the buckets into a jig feed to a coal-breaker. The breaker is of the four-roll type, with massive claw breaking-rolls, which are arranged to break the coal into pieces not exceeding 2 inches cube. The

small coal which does not require breaking is allowed to fall down a bye-pass shoot, without going through the breaker.

From the breaker the coal is fed to the boot of a steel bucket elevator, and by it is carried to the top of the retort-house and delivered on to a push-plate conveyor. This latter is carried the length of the retort-house over a range of hoppers, and coal is delivered by the conveyor to any of the hoppers, as required, through slide doors. The holding capacity of the hoppers is 100 tons of coal.

The whole of the coal-handling plant is designed for dealing with 25 tons of coal per hour; and sufficient coal can therefore be dealt with during the day time for the requirements of the night.

### Coal-Store.

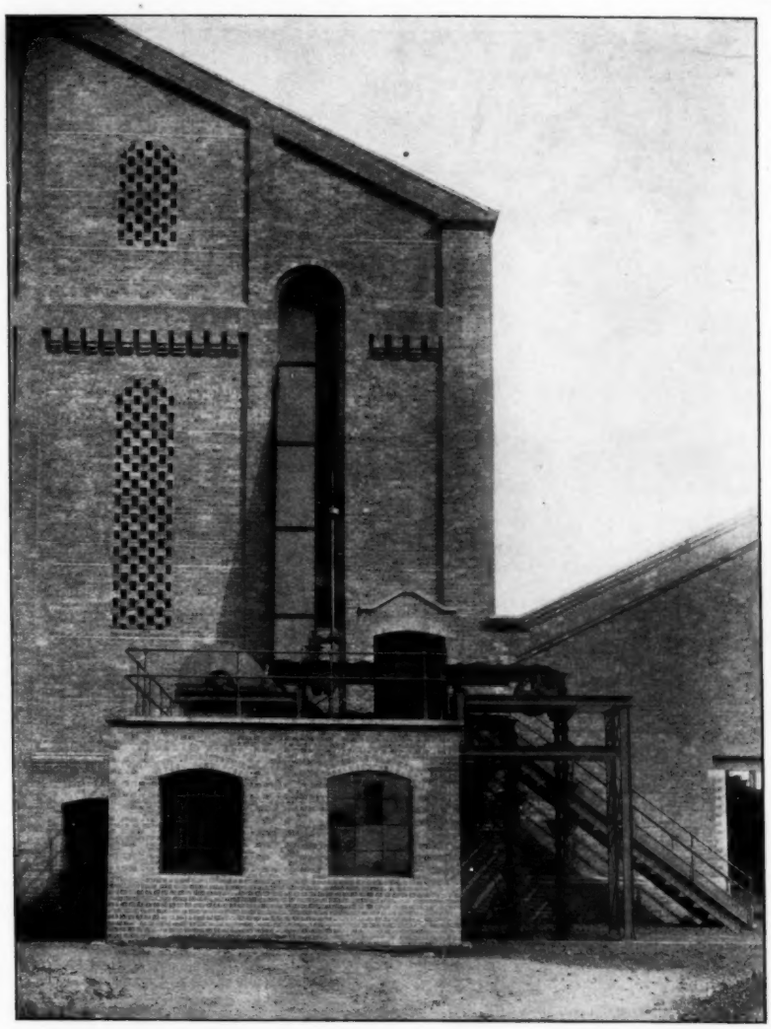
The bulk of the coal received is dealt with by the mechanical arrangements mentioned above; but on account of the unavoidable fluctuations between supplies and requirements, a coal-store is provided, and coal can be emptied into it direct from the railway waggons. The capacity of the store is 1400 tons.

### Retort-House.

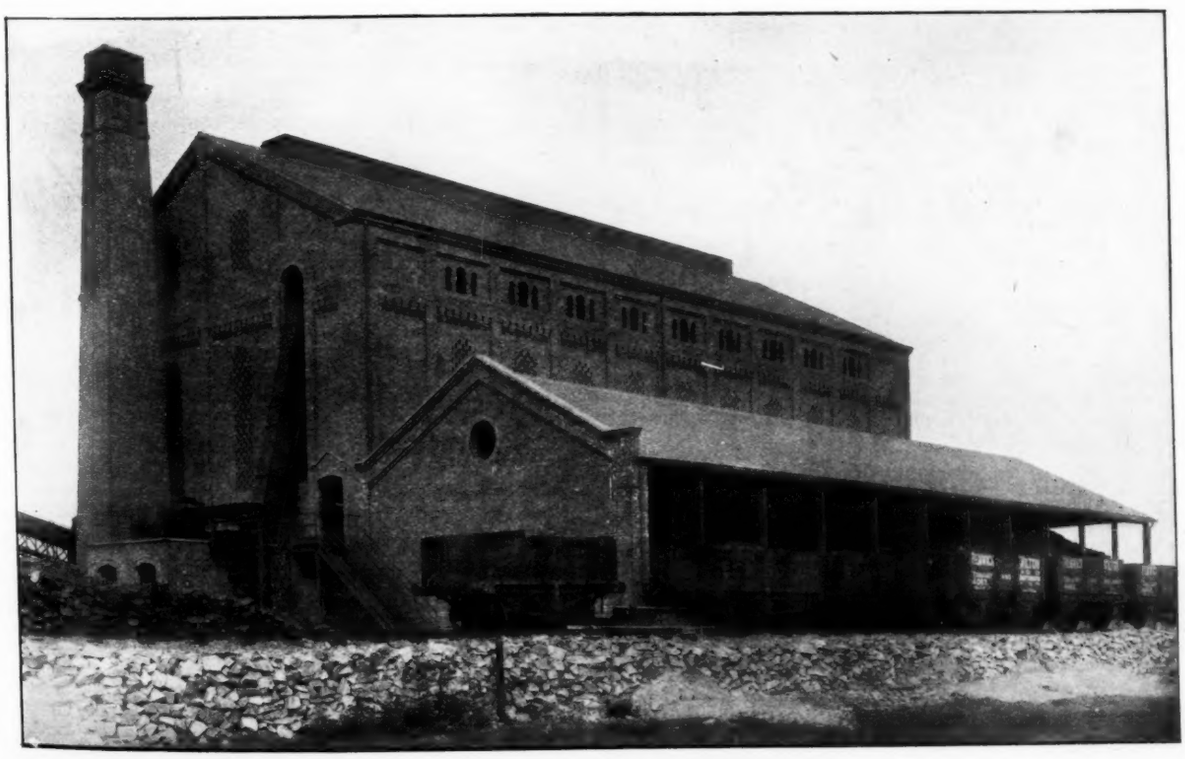
The retort-house is a steel framed building filled in with brickwork, and is 108 ft. 6 in. long by 60 ft. wide by 46 ft. high. Owing to the great weight which had to be carried in connection with this building, an elaborate system of concrete piles and concrete raft foundation was designed and provided to overcome the inherent weakness of the site for bearing capacity. The building has been so designed as to be readily capable of extension when required.

The retort-stack consists of eight settings of horizontal retorts, each setting containing eight retorts, 24 in. by 16 in. (D section) by 20 ft. long. The retorts are of moulded fire-clay, and are heated by deep regenerator furnaces, which give command of a high range of temperatures with a low consumption of fuel.

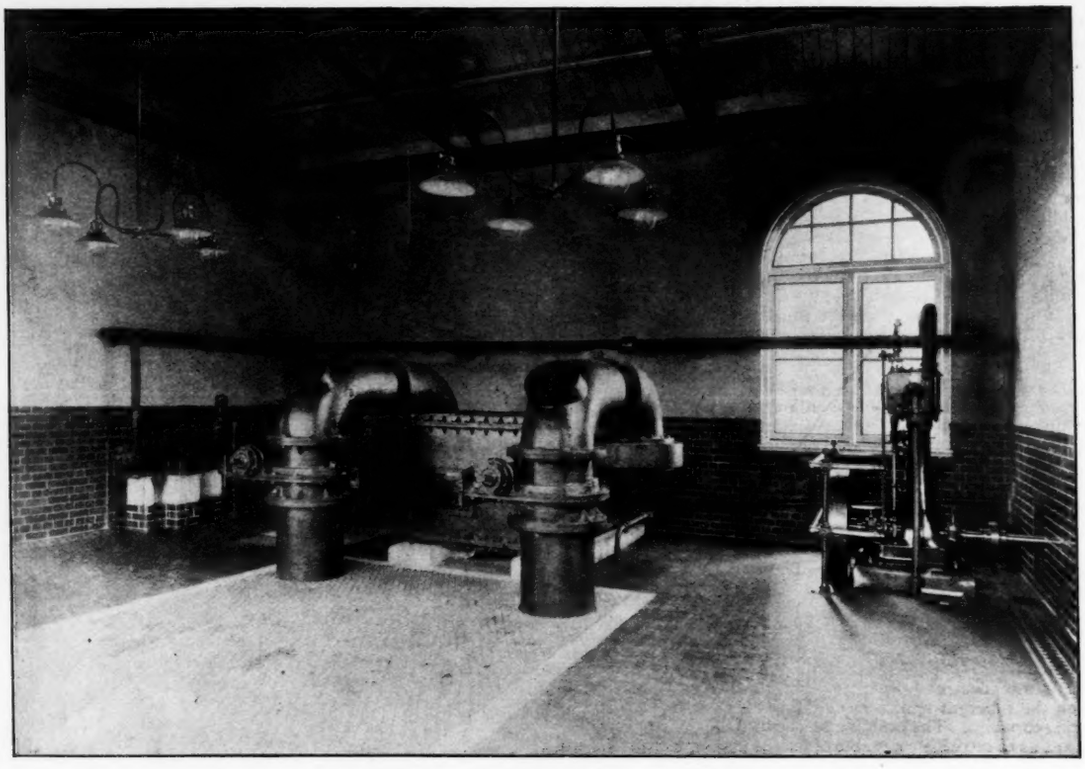
The work of charging and discharging the retorts is performed by a Fiddes-Aldridge simultaneous discharging - charger, which ejects the coke from the retort by a ram, and



COAL CONVEYOR AND ELEVATOR.



THE NEW RETORT-HOUSE AND COAL-STORE.



APPARATUS ROOM, SHOWING THE TAR-WASHER.

at the same time deposits a fresh charge of coal in the retort. The combined operation is effected in the short space of 35 seconds; and the weight of material dealt with in that time is from 17 to 19 cwt. The necessary supplies of coal are obtained automatically from the overhead coal-hoppers during the travel of the machine on tram-rails laid in front of the retort-bench.

The stoking machine is driven by electricity, produced at low cost by the Company's own generating plant, and has all the necessary travelling, hoisting, and lowering motions in addition to the charging and discharging mechanism. Although somewhat complex at first sight, the machine is quite easy to operate, and, considering the duties required of it, is an exceedingly simple and reliable piece of mechanism.

The red-hot coke, when discharged from the retorts by the stoking machine, falls into the trough of a coke-conveyor situated in the floor of the retort-house, on the opposite side of the bench to the stoking machine. The coke is drawn by the conveyor under a number of water sprays for quenching purposes, and is finally delivered on to the coke-heap outside the house. The total length of the coke-conveyor is 210 feet, of which 105 feet is outside the retort-house. By means of openings in the trough of the conveyor, to which doors are fitted, the coal can be delivered at any of the thirteen points, as desired. The coal and coke handling plants are driven by vertical steam-engines fixed in small engine-rooms in the retort-house cellar.

The retort-stack is fitted with ascension-pipes, hydraulic-mains, tar-mains, &c., on the stoking-machine side of the stack only. A tar-tower and retort-house governor are provided. From the hydraulic-mains, the foul main is carried along two sides of the retort-house, and thence underground, returning parallel to the retort-house to the condensers. These are of the vertical water-cooled type, and consist of two towers which may be worked separately or together, as necessary. They are purposely fixed on the north side of the retort-house, so as to be shaded from the direct rays of the mid-day sun, which would otherwise interfere with the efficient control of the plant.

### Apparatus House.

The exhausters, fixed in the apparatus house, are provided in duplicate, one set being always in reserve for stand-by purposes; and they are of the two-blade rotary type, direct driven by horizontal steam-engines.

The engine-room contains an electric generating plant for providing the electric current used for the driving of the stoking machine. There is also the necessary battery of gas pressure-gauges, jet photometers, and a recording calorimeter, for the observation and registration of the quality of the gas as manufactured and as delivered to the district for consumption.

In the room adjoining the engine-room is a Livesey washer for the elimination of tar and some of the ammonia impurities contained in the gas at this stage. The remainder of the ammonia is removed by a vertical centrifugal washer-scrubber outside the room, driven by a vertical steam-engine fixed inside the room. Sufficient space has been left in the buildings for additional apparatus which will be needed for future requirements.

The steam required throughout the works is supplied by two Lancashire boilers, each 26 ft. 6 in. long and 6 ft. 6 in. diameter, suitable for a maximum steam pressure of 100 lbs. per square inch. The boilers are fully equipped with feed pump, injectors, &c., and also special furnaces for the combustion of low-grade fuel.

The water supply for other than drinking purposes is obtained from a pond in the Royal Potteries ground. Owing to its hardness, a water-softening plant is provided to overcome the disadvantages attending the use of hard water in the steam-boilers. Tests which have been made show a reduction by the plant from 40° of hardness to 2° to 5° of hardness, by Clark's test.

After leaving the apparatus buildings, the gas is next treated for the elimination of a highly important constituent required for the manufacture of explosives. The necessary apparatus has been contrived out of disused plant brought from the old works. The importance of this process is shown by the fact that the explosive constituent required for the firing of forty to eighty shells per day is being, and will be, produced by the Company.

### Purifiers.

Four purifiers are provided, each being 25 ft. by 20 ft. by 5 ft. deep. They are of the luteless pattern, with two covers to each; the joint between the cover and the vessel being made gas-tight by means of india-rubber packing.

Very efficient and satisfactory purification is being obtained from the plant, and at the same time the working costs promise to show a considerable reduction on the cost of purification at the old works.

### Meter-House.

The last piece of apparatus in connection with the new works is the station-meter, which is of 80,000 cubic feet per hour capacity, and therefore capable of dealing with twice the amount of gas the works are at present able to produce.

### Distribution Workshops and Stores.

The workshops and stores for the distribution section were erected in 1913, and made a handsome addition to the Company's property. Although of considerable extent, the various rooms and buildings are fully occupied, owing to the extraordinary development during the past few years in the Company's business in the sale and hire of gas appliances. The popularity of gas cooking (there are 4455 gas-cookers in the area of supply) has rendered necessary the installation of several modern machines, forming a power plant for the more economical and satisfactory cleaning and renovating of these articles. Though this plant has been at work for a few weeks only, the results already attained are highly satisfactory, and the saving in labour costs considerable. In addition to the usual workshop appliances, a complete plant for the testing of gas-meters is installed.

# GAS AND HYGIENE.

By Dr. M. von Gruber, Professor at, and Director of, the Hygienic Institute of Munich University.

The lecture which Professor M. von Gruber delivered at the meeting of the German Association of Gas and Water Engineers at Munich in July last year, on "Gas and Hygiene," was published in the "Journal für Gasbeleuchtung" of the 24th-31st ult. An abstract of the lecture was given in the "Journal" shortly after its delivery [*vide*, Vol. CXXVII., p. 110]; but as the work of the Professor is the first exhaustive investigation in Germany regarding the hygienic aspects of gas for lighting and heating, it will be useful to give a fuller account of it for comparison with the similar investigations which have been made by various English chemists.

Professor von Gruber opened his lecture by referring to the violent attacks made publicly in recent times on the use of gas for lighting dwelling rooms. Such use has been stated to be incompatible with hygiene, because the air is said to get charged with harmful products, while its temperature and humidity are increased to an undesirable extent. On the other hand, there have been statements—emanating chiefly from England—that gas lighting purifies the air, destroys smells, and tends to disinfect the air of rooms; that its warmth considerably improves ventilation; and that, as a consequence, the air of an occupied room which is lighted by gas is better than that of one lighted by electricity. It seemed desirable, in view of such conflicting statements, to make an exhaustive investigation of gas lighting in its bearing on the atmosphere of dwelling rooms. The German Association of Gas and Water Engineers provided the means by which the Munich Hygienic Institute was able to study the problem in a thorough manner.

## The Experimental Rooms.

In the year 1904, a Committee of the German Association had investigated the question of the lighting of school rooms and drawing offices, and determined in what manner it could be carried out consistently with health requirements ["Journal," Vol. LXXXVII., p. 395]. The present investigation extended to the effect of gas lighting—in comparison with electric lighting—on the small living rooms and offices in which the bulk of the populace live from day to day.

In all such investigations change in the weather becomes a disturbing factor. Its effect was excluded as much as possible by carrying out the comparative observations and experiments simultaneously in two similar rooms—one being lighted by electricity and the other by gas. Suitable rooms for the purpose were found in Munich by Dr. E. Schilling, who, with Herr Ries, the Manager of the Gas-Works, and Dr. Schumann, who was responsible for the fitting and equipment of the rooms, greatly assisted the author in the investigation. A plan and sections of the rooms are shown in figs. 1 and 2 (p. 450). The rooms were on the third or uppermost floor of a tenement house of ordinary type, moderately well built, and in good condition. The windows faced nearly due east. The two rooms used for the investigations were of approximately the same size, each having a cubical content of 2016½ cubic feet, and both opening on to the same corridor. Between the two rooms was the laboratory, from which observations could be made, air-samples taken, &c., simultaneously on both sides. On the other side of the experimental rooms were unoccupied rooms of the same flat; and it was therefore possible to keep these rooms in precisely the same condition at any given time. The experimental rooms had practically identical ground plans, each had one window, and also one door opening on to the corridor. The doors between them and the laboratory were boarded-up, and apparatus was attached to the boarding as described later. One of the rooms originally had a third door; but this was taken out and the opening bricked-up. The actual dimensions of the rooms, as shown by the illustration are: Length, 20 ft. 3 in.; width, 10 ft.; height, 10 ft.

The stoves which were originally in the rooms were taken out and replaced by gas-fires, which were connected with the chimney; so that nothing of the products of combustion from the fires could escape into the room. Provision was made for taking the air supply—both primary and secondary—to the gas-fires, either from the corridor in order to leave the air of the room unaffected by the air required for heating, or from the room, in which case the fires contributed to its ventilation. Both rooms were similarly equipped with three inverted Graetzin burners, consuming 1·41 to 1·48 cubic feet of gas per hour at 22-10ths to 25-10ths pressure, and three electric metallic filament lamps. The lights were chosen to give the same illumination on the surface of the writing table. It was intended that this should be not less than 25 metre-Hefners; but actually each source of light afforded an illumination of from 40 to 50 Hefners, which is well in excess of hygienic requirements. A fan for mixing the air when required, controlled from the laboratory, was placed near the ceiling in each room. The gas-burners were ignited by the "Multiplex" self-lighting device. The rooms were not entered by anyone throughout an experiment. Windows were provided in the boarding of the doorway, through which observation on the rooms could be kept from the laboratory.

One room was provided, in order that it could be freely ventilated, with a ventilating fan in the window and a ventilating pipe in the angle of the ceiling above the stove. This pipe, which was about 10 inches wide, extended above the loft which was over the experimental rooms, and could be left open or closed tight as desired. In this room each of the walls was penetrated by three small tubes, which could be kept closed or could be connected with a differential pressure gauge, which enabled some very interesting results to be secured in regard to the distribution of pressure at the boundary walls of the room. The loft above the rooms was without partitions; so that in this respect both the experimental rooms were under identical conditions. Both rooms had a good oak flooring, which cut them off almost wholly from the air of the rooms on the floor below. There were a number of communicating pipes, by which air could be drawn from the experimental rooms, or apparatus introduced into them. One pipe, about 2 inches in diameter, open at both ends, but closed at will, extended well into the room, to allow of the mean temperature and mean humidity of the air being observed by means of an Assmann ventilating hygrometer, or for withdrawing air for respiration trials, or introducing carbonic acid from a cylinder. There were also fifteen narrow pipes passing through the boarding to different points of each experimental room, which made it possible to take samples of air from points at three different levels for the determination of carbonic acid, with a view to ascertaining its distribution in the air of the room. At the same points from which these air samples were drawn, there were placed carefully standardized resistance thermometers, all in connection with a single switch-board in the laboratory. The temperature distribution in each room could thus be observed at any time. In the laboratory there were also separate electricity meters, gas-meters, and pressure gauges for each room, as well as a Zuntz respiration apparatus.

The investigations assumed that the room might be used either as a living room, with the family sitting round a table lighted by a single lamp, or as an office with at the most three double desks or writing tables. Some tests were therefore carried out with the rooms lighted by one, two, and three lamps, either gas or electric. They were purposely made in as unfavourable weather conditions as possible—some in the summer and early autumn, but the greater part on warm days in the winter, when there was little wind and ventilation was therefore poor. Most of the tests lasted six to seven hours, some longer; thus corresponding with the winter's evening period of artificial lighting in lower-class households. Most of the investigations, comprising thousands of measurements and observations, were carried out by Dr. Hermann Ilzhöfer, the Assistant at the Hygienic Institute.

## Chemical Changes in the Air.

A single direct test only was made for sulphurous acid in the air of the room. In this test 80 cubic feet of gas were burnt in 18 hours, and the air was drawn through standard solution of iodine. With 10 litres of air no trace of sulphurous acid could be detected. This result agrees with expectation, seeing that coal gas contains from 11 to 52 grains of sulphur per 100 cubic feet, which volume, on combustion, would yield about 57 cubic feet of carbonic acid and only 0·018 to 0·084 cubic foot of sulphur dioxide. Thus for each volume of carbon dioxide there could be produced at the most 0·0015 volume of sulphur dioxide. Consequently, only traces of sulphur dioxide due to gas consumption could possibly be detected in the air.

A large number of tests were made for carbonic oxide in the air, mostly by the blood test, which is exceptionally sensitive, and is of great hygienic importance. Obviously carbonic oxide can only give rise to injurious effects if there is an appreciable absorption of it in the blood, as only in that case would the supply of oxygen to the system be endangered. The blood test did not give a positive result in any instance. Neither could carbonic oxide be detected by the iodine pentoxide method. Even when more than 350 cubic feet of gas were burnt in 67 hours in the experimental room, no carbonic oxide could be detected in four litres of the air of the room. This test would show results higher than the real proportion of carbonic oxide, because iodine pentoxide is acted upon by various hydrocarbons as well as by carbonic oxide. Some recent investigations by Dr. Terres [*vide* "Journal," Vol. CXXVII., p. 109] have shown that the extreme proportion of carbonic oxide which could have been produced in the lighting conditions of the experimental room would be of no importance. The maximum increase realized in the experiments in the carbonic acid in the air of the room when regarded as a living room, was 44 volumes per 10,000, which, according to Dr. Terres, would correspond with a maximum of 0·156 volume of carbonic oxide per 10,000. This is a proportion which breathing tests have shown to be quite harmless to the system.

A number of tests were made on the proportion of nitrogen oxides in the air of the room when lighted by gas. The greater part were merely qualitative tests with indol, and in no case was nitric oxide detected. Some quantitative tests were made by the method of Haber and Coates. In an extreme case, in which four inverted burners consuming not less than 2·8 cubic feet per hour were kept burning for 42 hours, the proportion of carbonic acid reached by the end of the test was 138 volumes per 10,000, and the proportion of nitrogen oxides, reckoned as nitric oxide, was then 0·104 volume per 10,000 volumes of air. These figures agree well with the ratio between carbonic acid and nitric oxide observed by Dr. Terres in his investigation of the products of combustion of coal gas. The presence of nitric oxide is not necessarily prejudicial, because the oxides of nitrogen, when highly

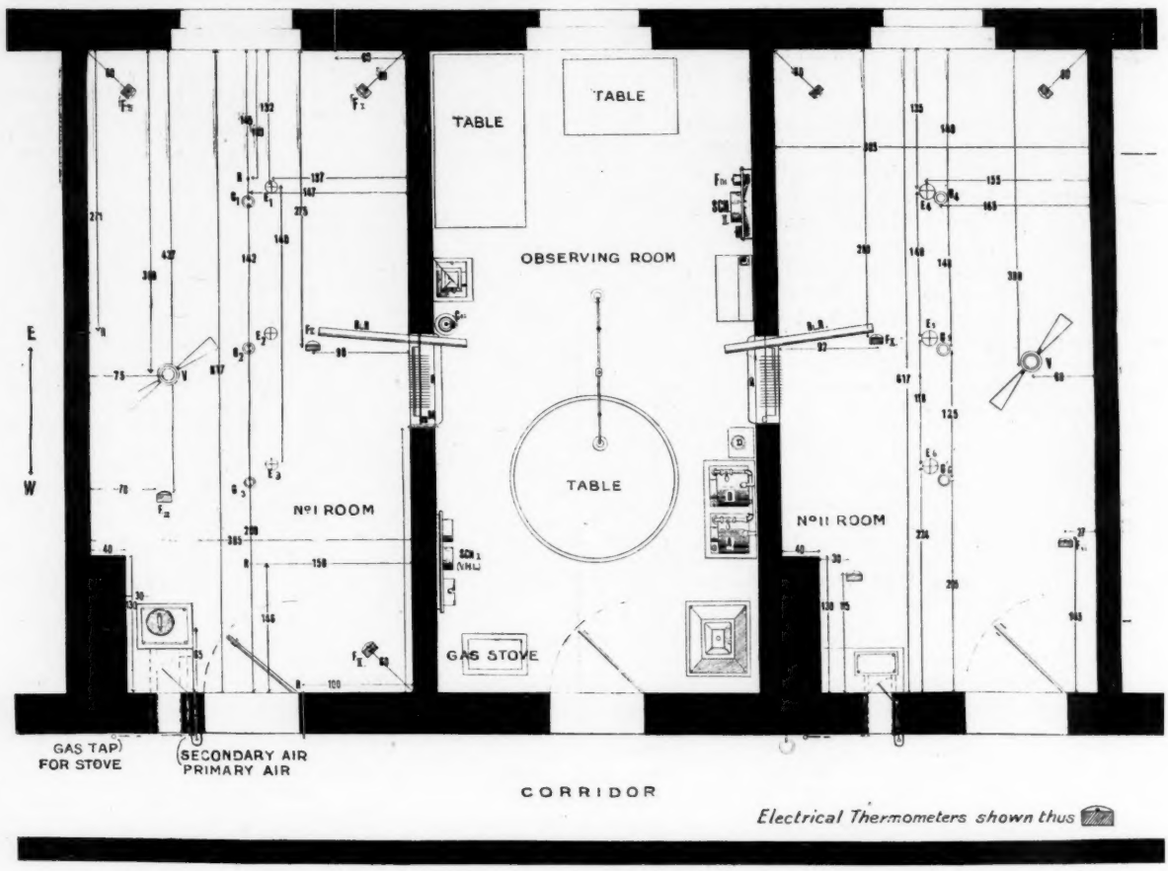



**Fig. 1.—PLAN OF THE ROOM USED.**

[Distances marked in Centimetres—30·48 cms. = 1 foot.]

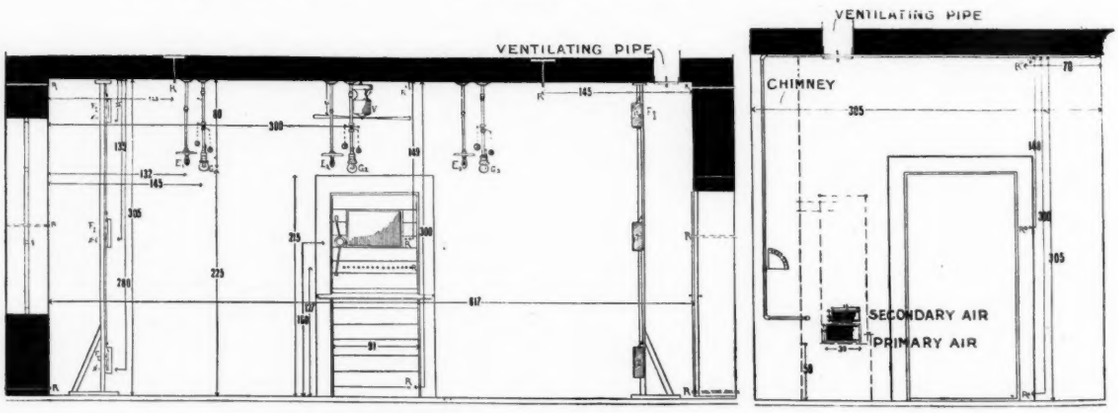
REFERENCES.

$G_1$ = Gas lights.
$E_1$ = Electric lights.
V = Fans.
M = Multiplex gas igniter.
Bl.R = Metal pipes.
R = Pipes through ceiling and walls.
SCH I. = Switchboard for fans.
,, ,, electric lights.
,, ,, electric heaters.

FTH. SCH II. = Switchboard for electrical thermometers.

| | | |
|---|---|---|
| Electrical thermometers I. = | 1, 6, 11 | |
| ,, ,, II. = | 2, 7, 12 | |
| ,, ,, III. = | 3, 8, 13 | No. I. Room. |
| ,, ,, IV. = | 4, 9, 14 | |
| ,, ,, V. = | 5, 10, 15 | |
| ,, ,, VI. = | 16, 21, 26 | |
| ,, ,, VII. = | 17, 22, 27 | |
| ,, ,, VIII. = | 18, 23, 28 | No. II. Room. |
| ,, ,, IX. = | 19, 24, 29 | |
| ,, ,, X. = | 20, 25, 30 | |

A = Gas meter for No. I. Room. B = Gas meter for No. II. Room. D = Registering pressure gauge.




Longitudinal Section. Corridor End.

**FIG. 2.—SECTIONS OF No. 1 ROOM.**

[Distances marked in Centimetres—30·48 cms. = 1 foot.]

diluted, act beneficially on the mucous membrane. The trifling quantity—viz., 0·066 volume—of nitric oxide in 10,000 volumes of air, which corresponds with the maximum of 44 volumes of carbonic acid per 10,000 found in the experimental room when used in living room conditions, is, moreover, not of the least hygienic importance.

A couple of tests were made for the presence in the air of the gas-lighted room of soot or dust singed by the flame. After 21·2 cubic feet of gas had been burnt in one room in 49 hours, 500 litres of the air were sucked through a paper filter, and the same quantity from the air of the electrically lighted room through a similar filter. On comparison, the former paper was found to be somewhat darker and smoky; but the amount of impurity thus indicated was quite insignificant. It was noticed on entering the room, after it had been lighted by gas for six or seven hours, that there was the well-known smell, peculiar to gas lighting, which is

difficult to describe, is somewhat choking, but after a few breaths have been taken is not noticeable. It does not appear to be of the smallest significance; and its origin seems not to have been traced.

### Production and Effect of Carbonic Acid.

In the examination of the air of the gas-lighted room attention was chiefly given to the proportion of carbonic acid. To a small extent the determinations of carbonic acid were made by the Pettenkofer tube method, which gives average values; but the greater part of the tests were made with Haldane's apparatus. The author believes that this is the first instance of the use on a considerable scale in Germany of this apparatus, which he can most cordially recommend. A few details of manipulation have to be learned, and then the proportion of carbonic acid in parts per 10,000 can be ascertained with it extremely rapidly and conveniently, with an accuracy of one part in 10,000. The room was

Table I.—*Effect of Gas Lighting on the Temperature, Humidity, and Carbonic Acid Content of the Air of a Room.*

| No. of Tests Made. | No. of Burners in Use. | Illumination of the Table or Tables. | Duration of Each Test. | Increase of Temperature During the Test. | | | Relative Humidity at End of Test. | Change of Humidity During Test. Per Cent. | | | Carbonic Acid in Air at End of Test. | Increase of Carbonic Acid During Test. Parts per 10,000. | | | Ventilation. Cubic Feet per Hour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Maximum. | Minimum. | Mean. | | Maximum. | Minimum. | Mean. | Parts per 10,000 | Maximum. | Minimum. | Mean. | Maximum. | Minimum. | Mean. |
| | | Lux. | Hours. | ° Fahr. | ° Fahr. | ° Fahr. | Per Cent. | | | | | | | | | | |
| 6 | 1 | 45 to 50 | 6 to 7 | 5·4 | 1·5 | 3·7 | 34 to 59 | + 6 | − 1 | + 1·8 | 8·5 to 15·0 | 10·3 | 3·6 | 7·19 | 2782 | 1063 | 1666 |
| 14 | 2 | 31 to 51·5 | 4 to 7 | 4·9 | 0·7 | 2·7 | 33 to 86 | + 17 | − 3 | + 3·7 | 13·9 to 38·5 | 25·5 | 9·1 | 16·00 | 2302 | 321 | 1285 |
| 13 | 3 | 35 to 58 | 6¼ to 9 | 7·9 | 2·3 | 5·6 | 49 to 79 | + 12 | − 6 | + 6·2 | 22·5 to 44·0 | 39·15 | 17·25 | 27·22 | 1769 | 681 | 1281 |

in all cases thoroughly ventilated at the outset of a test; and the carbonic acid contained in the air then was generally found to be 4 parts per 10,000. This was deducted from the amount of carbonic acid found at any subsequent hour in the course of the test in order to show the increase in the proportion of carbonic acid. Table I. gives a summary of the results obtained in a number of tests, in which the room was lighted first with one gas-burner, then with two, and then with three burners.

It will be seen that with one burner consuming about 1·48 cubic feet of gas per hour, and giving an illumination on the table of about 50 metre-hefners, the increase in the proportion of carbonic acid has not exceeded 10·3 parts per 10,000. In the tests with two burners, the maximum increase in the carbonic acid was 25·5, and with three burners the maximum increase was 39·15 parts per 10,000. It should be pointed out that the proportion of carbonic acid in a lighted room, like temperature and humidity, does not continue to rise to an unlimited extent, as would be the case if the room were hermetically sealed. Dwelling rooms, however, have walls which are permeable in a very high degree; and in a comparatively short time a point is reached at which the proportion of carbonic acid remains stationary, owing to the ventilation through the walls. A large number of tests were made, in which the proportion of carbonic acid was determined every hour; and the results showed that this stationary position or maximum was attained in a comparatively short time—viz., within five to six hours. The same thing occurs in regard to the temperature of the room, which rose only by a few tenths of a degree in the later hours of each test.

The distribution of carbonic acid in the air of the room, as ascertained from analyses of samples taken simultaneously at fifteen places in the room, presents an interesting study. Thus, in seven tests, in four of which one burner was used, in two, two burners, and in one, three burners, the proportion of carbonic acid at the floor level averaged 12·5 parts per 10,000; at the breathing level, 15·6 parts; at the ceiling, 17·6 parts. The mean proportion of carbonic acid at the breathing level was found to correspond almost exactly with the average of the carbonic acid content of the whole room. As a fact the differences between the proportions of carbonic acid at the floor and breathing levels and at the ceiling are trifling when regarded as absolute values instead of as percentages, which is the way in which they should be considered from the hygienic standpoint. This controverts the contention that with gas lighting the rise of temperature increases the ventilation through the ceiling to such an extent that the products of combustion never reach the breathing level of occupants of the room. This is not the case to any appreciable extent, as in quite small rooms the currents of air due to differences of temperature between the floor, walls, and ceiling constantly effect a thorough mixing of the air. This alleged advantage of gas lighting thus does not exist.

### Physiological Effect of Products from Gas-Burners.

Special attention was given to determining the physiological effect of air contaminated with the products of combustion of gas. These tests were specially important, as the most serious attacks on gas lighting in recent times have depended on this question. These attacks occur especially in the writings of Wolpert—a popular scribbler of articles of a more or less scientific character in various newspapers. He assumes that air contaminated to a very small extent by the products of combustion diminishes the evolution of carbonic acid and the absorption of oxygen by the body—thus causing a certain stagnation of the metabolism of the system.

Numerous experiments have been made on three individuals. The most important result of these experiments is that it is shown that a comparatively trifling increase in the proportion of carbonic acid in the air breathed increases the volume of air breathed. This is exactly the opposite effect to that indicated by Wolpert, who states that a diminution, instead of an increase, of the volume of air breathed ensues. It should be pointed out that there are considerable difficulties in carrying out such investigations on human beings, because the human system does not work with absolute precision, but is subject to very many influences which cause fluctuations that have to be taken into account. Apart also from such irregular influences, there is often a continuous change in the course of an experiment. The experiments to be of any value must be made on persons whose muscles are completely at rest, so that their metabolism is at a minimum. In these tests the subjects reclined in an easy chair, so that they could remain for some hours without moving. All their muscles first became relaxed. Some time had to be allowed for the effect of previous activity to pass away. The results of these tests, as tabulated by the author, show clearly that with continuous breathing of ordinary air the volume breathed falls off, and only towards the close of the experimental period begins to rise again a little, probably because the subject becomes restless. On the other hand, the breathing of air containing more carbonic acid causes a distinct increase in the volume breathed, and even towards the close of the test period the volume breathed remains higher than in the control test with ordinary air.

The results of this series of tests are summarized in Table II., in which the average volume of the breathing with normal air is taken as 100. The results show clearly that the breathing increases with the proportion of carbonic acid in the air inhaled.

Table II.—*Relation between Carbonic Acid in the Air and Volume Breathed.*

| Source of Carbonic Acid and Number of Tests made. | | | Average Number of Volumes of Carbonic Acid per 10,000 Volumes of Air. | Mean Volume of Breathing (Normal = 100). |
|---|---|---|---|---|
| Cylinder. | Breathing. | Burning Gas. | | |
| 1 | — | — | 11·0 | 95·7 |
| 2 | — | — | 22·0 | 104·1 |
| 1 | 1 | 1 | 61·0 | 108·2 |
| 2 | 1 | — | 90·0 | 112·7 |
| — | 3 | 2 | 100·5 | 112·0 |
| 2 | — | 4 | 140·8 | 118·8 |

The production of carbonic acid by individuals was then studied; and it was found that there was no question of retention of carbonic acid when the air was enriched by products of the combustion of gas, but instead a small rise in the output of carbonic acid was actually demonstrated. This was no doubt brought about through the deeper breathing causing more thorough aëration of the blood, and so diminishing its content of carbonic acid.

The results of twenty-five tests on the oxygen consumption of individuals when breathing, firstly, ordinary air and, secondly, air enriched by carbonic acid have been collected. They appear to indicate a somewhat lower oxygen consumption with the air enriched by carbonic acid; but the differences observed between tests with such air and the tests with normal air fell well within the fluctuations among tests with one class of air alone. Hence the reduced oxygen consumption cannot be regarded as proved. Many more tests would be necessary to arrive at a definite conclusion; but such tests involve a great deal of work, and are trying to the subjects of them. Absolutely no regularity is shown by the results of the tests so far made. As in the case of the tests recorded in Table II., some were made with pure carbonic acid and some with air vitiated by breathing as well as with air enriched with the products of combustion of gas.

In one test twelve persons were shut up for six hours in the room of about 2015 cubic feet cubical content. On entering the

room at the end of this time the air smelt very nasty; but if breathing through the mouth only was adopted—the nose being closed by a clamp, so that nothing could be smelt—the subject received no special impression from this air, and experienced no subjective sensation which distinguished it from ordinary air. In other tests, carbonic acid from a cylinder was liberated in the experimental room. No differences could be detected between the effect of air contaminated by breathing, air enriched by pure carbonic acid, and air rendered impure by the combustion of gas. The effect observed on the volume of the breathing can thus be ascribed with certainty solely to the proportion of carbonic acid; and there is no reason to suspect that other products of combustion—such as those resulting from incomplete combustion, which enter the air of the room—have any effect on breathing.

Experiments were made to confirm Weichardt's observation that air enriched with the products of combustion of gas has no effect on the action of catalysts. Large volumes—50 litres and over—of air highly contaminated with products of combustion of gas were drawn through the solution of the catalyst; but no diminution in its activity could be detected.

### Temperature Effects of Gas Lighting.

Very many observations were made on the effect of gas lighting on the temperature of the room. It will be seen from Table I. that, when one burner only was in use, the maximum rise of temperature observed was 5·4° Fahr.; with two burners, 4·9° Fahr.; and with three burners, 7·9° Fahr. These increases of temperature caused an objectionably high final temperature of the air of the room only in cases where the initial temperature had been high owing to the room having been overheated at the outset.

In regard to the distribution of temperature, the temperature at the breathing level corresponded approximately with the average temperature of the whole room after the mixing fan had been brought into use. High temperatures were rarely attained. According to the investigations of Flügge and his pupils, the temperature of 70° Fahr., accompanied by suitable humidity, must be generally regarded as the maximum desirable in a room. This point will be again referred to later. The temperatures at the ceiling, when the air was not stirred, were higher, showing increases during a test of more than 9° Fahr. These temperatures obviously have no direct bearing on the air breathed or on warming the body by conduction through the skin; but it may be assumed that the ceiling itself is at about the same temperature as the air in contact with it, and the effect of radiation from the ceiling in warming the body must be considered. For the uncovered head a temperature of 75° Fahr. may be regarded as the best temperature for ceiling radiation. In the course of the experiments a ceiling temperature as high as 82° Fahr. was once nearly attained.

### Humidity Effects of Gas Lighting.

The relative humidity of the air is very important; since, in conjunction with the temperature, it becomes the determining factor in regard to keeping the body warm. Referring to the tests recorded in Table I., the relative humidity in the living room conditions [with one gas-burner only in use] remained low—*i.e.*, about 42 per cent. of saturation on the average. This is inclined towards the low side; for the humidity with such room temperatures should fall between 40 and 60 per cent. of saturation. The humidity was always 0·2 inch and sometimes over 0·4 inch of mercury below the saturation limit. The experiments have disproved the statement, which is common in much so-called scientific literature, that gas lighting increases the humidity of the air of a room to such an extent that it becomes saturated, and water condenses on the walls, making them mouldy. Contrary to this statement, it is doubtful whether the air is, in fact, sufficiently moist.

When two gas-burners were used in the experimental room, the relative humidity was appreciably higher, averaging 54 per cent. of saturation. This figure is well within the limits laid down for the permissible range. The extremes observed were 86 and 33 per cent.; the highest relative humidity occurring when the temperature of the room was low. When three gas-burners were used, a still higher relative humidity was produced; the average at the end of the tests being 68 per cent. of saturation. While many of the readings were well above the commonly accepted maximum of 60 per cent., there was in no case anything approaching saturation; and throughout the experiment a condition was never reached in which condensation would occur and water be deposited on the walls, furniture, or floor of the room. In all tests the room had been unoccupied; so that the heat and moisture produced by human beings were not added to those resulting from gas lighting. In some instances, however, when the rise of temperature was relatively greater than the production of aqueous vapour, the humidity was lower at the end of the test than at the beginning.

### Comparison of Effects of Gas and Electric Lighting.

Especially interesting were the results of a series of comparative tests recorded in Table III., of the effect on the temperature and humidity of the air of gas and electric lighting—gas being used in one room and electricity in the other. The difference between the increase of temperature in the two rooms is shown to be always trifling. The gas-lighted room acquires a rather higher humidity than the electrically lighted room; but the maximum difference found was only 10 per cent. In two sets of the comparative tests the rooms were occupied by people.

(*To be continued.*)

Table III.—*Comparison of Effect of Gas and Electric Lighting in the Same Conditions on Temperature and Humidity of the Air of Rooms.*

| Date of Tests. | Mode of Lighting and Number of Lamps. | Number of Occupants of Room. | Duration of Test. | Gas Consumed. | Temperature. | | | Difference between Rise of Temperature with Gas and Electricity. | Relative Humidity. Per Cent of Saturation. | | | Difference in Increase of Humidity with Gas and Electricity. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | At Beginning. | At End. | Rise. | | At Beginning. | At End. | Increase. | |
| 1912. | | | Hours. | Cubic Feet. | ° Fahr. | ° Fahr. | ° Fahr. | ° Fahr. | | | | |
| April 18 | E2 | .. | 4 | .. | 51·4 | 51·4 | .. | + 0·7 | 81 | 86 | 5 | − 1 |
| ,, | G2 | .. | 4 | 17·65 | 51·4 | 52·1 | 0·7 | | 82 | 86 | 4 | |
| May 31 | E2 | .. | 4 | .. | 61·3 | 62·0 | 0·7 | + 0·9 | 65 | 72 | 7 | + 10 |
| ,, | G2 | .. | 4 | 10·59 | 61·0 | 62·6 | 1·6 | | 60 | 77 | 17 | |
| June 10 | E2 | .. | 4 | .. | 67·6 | 68·0 | 0·4 | + 0·9 | 66 | 67 | 1 | + 3 |
| ,, | G2 | .. | 4 | 12·36 | 67·6 | 68·9 | 1·3 | | 68 | 72 | 4 | |
| ,, 14 | E3 | .. | 7 | .. | 66·6 | 68·4 | 1·8 | + 2·9 | 53 | 58 | 5 | + 2 |
| ,, | G3 | .. | 7 | 38·83 | 66·2 | 70·9 | 4·7 | | 57 | 64 | 7 | |
| ,, 20 | E2 | .. | 7 | .. | 68·0 | 69·1 | 1·1 | + 1·8 | 67 | 68 | 1 | + 3 |
| ,, | G2 | .. | 7 | 21·18 | 68·0 | 70·9 | 2·9 | | 69 | 73 | 4 | |
| ,, 21 | E2 | .. | 7 | .. | 66·6 | 67·3 | 0·7 | + 2·9 | 67 | 68 | 1 | + 4 |
| ,, | G2 | .. | 7 | 17·65 | 66·2 | 69·8 | 3·6 | | 64 | 69 | 5 | |
| 1913. | | | | | | | | | | | | |
| Jan. 28 | E1 | 5 | 4 | .. | 63·3 | 68·7 | 5·4 | + 0·9 | 43 | 50 | 7 | + 5 |
| ,, | G1 | 5 | 4 | 5·72 | 62·8 | 69·1 | 6·3 | | 42 | 54 | 12 | |
| Feb. 28 | E1 | 6 | 6 | .. | 61·9 | 69·8 | 7·9 | − 0·5 | 36 | 57 | 21 | + 1 |
| ,, | G1 | 6 | 6 | 9·04 | 62·4 | 69·8 | 7·4 | | 36 | 58 | 22 | |

## War Service by Technical Men.

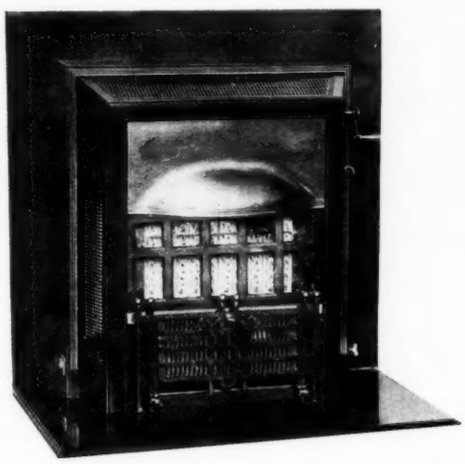
The Royal Society are compiling a register of scientific and technical men in Great Britain and Ireland, who are willing to give their services in connection with the war. The register is classified into subjects, and will ultimately constitute a large panel of men of standing whose services will be available whenever any Government Department or similar authority requires specialist assistance. The register is being co-ordinated with those independently compiled by other societies and institutions; but the Royal Society would be glad to have applications for forms from such members of the staffs of colleges and technical institutions as have not yet been registered by any society. The Royal Society are also drawing up, with the co-operation of the principal societies and institutions, a list of scientific and technical men actually on active service in His Majesty's forces. Any names, with rank and unit, for this list will be gratefully received by the Secretaries at Burlington House. The task of forming this register has been much facilitated by the assistance of many universities, university colleges, and scientific societies, whose help the Royal Society gratefully acknowledge.

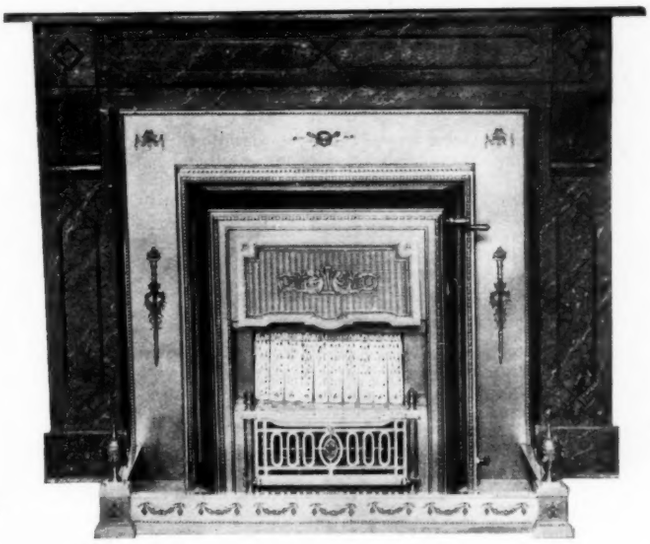
**British Association Meeting.**—According to "Engineering," the Engineering Section will have presented to them next week reports by two Committees, on Gaseous Explosions and on Complex Stresses. Connected with the former report will be papers on the "Experimental Investigation of the Thermal Efficiency of a Gas-Engine," by Professors G. Asakawa and J. E. Petavel, and on the "Apparent Specific Heats in Gaseous Explosions," by Professor W. M. Thornton. There will also be a paper on a "Unit Gas-Producer for Steam-Boilers," by Mr. E. C. Mills. Of special local interest will be a paper, by Professor A. B. Field, on the "Work of the Mechanical Engineering Department of the Municipal School of Technology at Manchester," and a paper by Mr. de Courcey Meade (City Surveyor of Manchester), the title of which has not yet been announced.

# AMERICAN GAS FIRE-PLACE COMPETITION.

### The Report of the Jury.

It may be remembered that nearly twelve months ago—see "JOURNAL" for Aug. 25, 1914, p. 476—a Joint Committee was appointed by the American Gas Institute and the National Commercial Gas Association for the purpose of holding a competition for a gas fire-place heater design; and in the "JOURNAL" for the 3rd inst. (p. 236) it was mentioned that the award had been made by the Jury appointed for the purpose—composed of three well-known Philadelphia architects. The winner of the competition is a firm in Rotterdam, known as "R. S. Stokvis and Zonen, Limited," who submitted several designs, two of which are shown in the accompanying illustrations.





There were seventeen competitors, who submitted from one to six designs each; and the decision of the Jury was arrived at only after very careful consideration of all the points. The following extracts are from the letter of the Jury making the award:

> The undersigned, appointed as architects to serve on the Jury for the competition instituted by the American Gas Institute and the National Commercial Gas Association for a fire-place heater burning gas, beg to report that, after a careful examination of all the designs submitted, and a thorough study of the problem, we are prepared to recommend that the award of the prize be made to the design marked "Exhibit B," submitted by R. S. Stokvis and Zonen, Limited, of Rotterdam, Holland.
>
> In arriving at this conclusion, we have taken into consideration the following conditions referred to in the programme.
>
> 1. That the heater should be artistic in appearance both when lighted and unlighted.
> 2. That the heater shall be designed for a fire-place, and shall be a device distinctly for the burning of gas.
> 3. That the heater shall not be an imitation of a wood or coal fire.

Referring to the winning design, the Jury say: "We find that it has artistic merit, and will have a good appearance both when lighted and unlighted. It depends on gas only for its fuel. It is designed to fit in an open fire-place with a flue to carry off the products of combustion; and its designers claim a form of flue construction which allows the greatest efficiency from the combustion of the gas, which nevertheless entirely prevents the escape into the room of the products of combustion. It radiates direct heat from a ceramic material, which is heated to a bright red by bunsen burners; and most of the heat is given off in the form of radiant heat. It is provided with a series of vertical tubes, which, when heated by gas-flames, produce an indirect heat by warming air entering at the bottom of the heater and passing out at the top and sides. The device of a mica screen makes it possible partially to moderate the heat; and when the heater is not lighted, it offers an opportunity for an artistic screening of the front. We consider that the design of this heater offers interesting possibilities in the development of its details."

The Jury also refer to "several of the designs which are worthy of mention, and in a measure they follow the principles of the fire-place to which the award was made, but fall short of it in excellence."

Special mention is made of one design, which was excluded from consideration because it is not really a gas heater. "Nevertheless, on account of its artistic design and its possibilities in connection with heating problems in general, we think it is worthy of separate mention. The principle of this design is that of a grille, which will not only allow the passage of warmed air through it, but also, becoming heated, actually radiates heat. It could be used as well in connection with a steam or hot-air heating plant as with a gas-burner."

Referring to the winning design, which is briefly described in the quotation in the award of the Jury, attention is called particularly to the movable screen, which may be made of mica or other material, of artistic appearance, and which will serve not only as an artistic screen, but as one which will protect the ceramic material from the accumulation of dust at the times when the heater is not lighted. Attention is called by the successful competitor to the fact that this appliance should be connected to a chimney for the purpose of ventilation, but the chimney draught is not essential for proper operation of the gas-fire. While the heater is primarily of the radiant heat type, the circulation of air about the heater gives a good deal of heat of convection—the competitor saying that the temperature of the air issuing from the passages is between 400° and 500° Fahr.

The design referred to by the Jury in their special mention, may be placed in front of a luminous flame heater which does not require a flue connection, and which may, therefore, be available in the rooms where flues are not installed, although, in the opinion of the Joint Committee, this practice is not one to be encouraged.

Some of the other designs are quite similar in principle to that of the winning competitor, and all are interesting.

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Further information regarding the designs and the addresses of the various competitors may be obtained by communicating with Mr. W. J. Serrill, the Chairman of the "Joint Committee on Fire-Place Heater Design," to whom we are indebted for the above information, as also for four photographs of the screens on which were exhibited the detail drawings of the various stoves submitted for adjudication. Mr. Serrill is the Engineer of Distribution to the United Gas Improvement Company, Broad and Arch Street Philadelphia.

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**Employment for Wounded French Gas-Workers.**—The Committee of the Société Technique du Gaz en France have appointed a Committee of six to consider the question of finding suitable employment for men connected with the gas industry who have been partially disabled in the service of their country. The Society will be represented by three members (MM. Bigeard, Gautier, and Marquisan), and the other three (MM. Delebecque, Lesage, and Monthiers) will be delegates of the Syndicat Professionnel de l'Industrie du Gaz. Managers of French gas-works are earnestly requested to put themselves in communication with the Committee, at the offices of the Société Technique, No. 94, Rue St. Lazare, Paris, if they have suitable positions to offer.

**Metropolitan Munitions Committee.**—Excellent work is, it is stated, being done by the Metropolitan Munitions Committee, the organization of which is now practically complete. The jurisdiction of the Committee extends over the whole of the Metropolitan Police area, which has been divided into ten districts, each under a district manager, associated with an assistant and a munitions engineer. It has already been stated in the "JOURNAL" that Mr. G. M. Gill (Assistant-Engineer of the Commercial Gas Company) has been appointed District Manager of the Stepney and Poplar district, and Mr. W. G. Head (Superintendent of Mains of the South Metropolitan Gas Company), of the South-Eastern district. Among the other appointments, Mr. S. H. Wood (of the Beckton Gas-Works) is Manager of the Outer Eastern district, and Mr. A. H. Seabrook (acting) of the Northern district. A central office for the Committee has been established at Alexandra House, Kingsway.

# THE MONO-RAIL TELPHER.

## ITS INSTALLATION, CARE, AND MAINTENANCE.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

The mono-rail electric telpher is rapidly becoming a standard plant in modern gas-works; and no greater tribute has ever been paid to its general reliability than the readiness with which gas engineers are both willing and anxious to instal it in positions of vital importance.

No factor contributes more largely to the satisfactory operation of a telpher plant than does the care with which it is, in the first instance, installed and the attention with which it is afterwards handled and maintained. While the breakdown of a telpher may not in normal times lead to a cessation in the manufacture of gas, it is a sure thing that it will lead to the creation of heavy charges for hand labour in connection with the manual handling of hot coke or coal as the case may be. Such charges are of necessity bound to follow upon the breakdown of a single telpher installation in normal times; but in times such as these, when the greatest difficulty is experienced in the proper staffing of works, it is quite possible, and even likely, that such a breakdown would lead to a serious diminution in, if not a total cessation of, the make.

Such possibilities, however, are happily remote in telpher plants where a good machine has been purchased and been installed in an intelligent manner; and it is the author's intention in this article to give a *résumé* of the possibilities of the modern telpher, together with some suggestions which his own experience has shown will result in the satisfactory operation of, and the minimum amount of trouble with, telpher plants.

The engineer who proposes to put down a telpher plant should in the first place look a bit ahead, bearing in mind the capacity of his existing plant, the demands of his district, and the possible extensions which he may have to make during the useful life of the telpher—always having in view the extended use to which in the future he may have to put his telpher and the mono-rail track extensions which the laying down of new gas making plant may render desirable. Alterations and the provision for extensions which can be easily provided for in the original drawings, and at a trifling cost, may often prove to be most costly, if not practically impossible, when once the plant has been put into commission.

He should bear in mind that the machine which he is now putting in for the handling of coal will do equally well for the conveying of coke from the discharge side of his retorts to an outside storage, provided he designs his track and machine with this possibility in view. If in the future he decides to put down a telpher coke-handling plant, it would be a great advantage if his general arrangements permitted of his linking-up the two tracks in such a manner as to enable him to use either telpher for either purpose. It is necessary, of course, to make special arrangements to enable the machine to handle either a coke skip or coal grab.

The mono-rail telpher has now been established in such a large number of works that it is possible to give a reliable account of the results which may be expected, the cost of maintenance, and to show clearly what advantages telpherage possesses over other methods of conveying. It is important to distinguish between telpherage which is a mono-rail system and the earlier—and in the writer's opinion less efficient—form of "transporter" which runs on the inside of the bottom flange of a beam or girder of H section; and in a later portion of this article it is proposed to deal more fully with this point.

Among other matters that have to be considered when it has been decided to supersede hand labour or out-of-date machinery by new plant the most important factors are working efficiency, maintenance, convenience, and first cost.

### Working Efficiency.

The question of working efficiency is inseparable from that of convenience; and both these factors give rise to the question, What is the right kind of plant to instal having regard to the facilities required? It is then that the following points crop up: Load, maximum lift required, length of travel, whether the route is curved or straight (this is a point of vital importance), variation of delivery height, whether the load has to be picked up again by the same plant for further conveyance, and speed of working.

If the run is short and straight, at an unvarying height, and the load does not have to be picked up again after discharge, then it may be said that the telpher does not, under ordinary conditions, show to any advantage over the ordinary type of tipping conveyor. On the other hand, where these simple conditions are reversed, and material has to be transmitted at either a considerable or a varying height over a long curved route, or where, in addition to these circumstances, perhaps, the load has to be handled again, then there are emphatically conditions which can be best met by the installation of a telpherage system.

For quayside work the telpher can be run out on a hinged cantilever beam over the hold of the vessel to be loaded or unloaded; while when not in use, or to permit of shifting the boat or berthing her, this cantilever beam may be raised to a vertical position. In deciding the type of conveyor plant to be put down, the following facts regarding telpherage are worth noting.

### Points Regarding Telpherage.

(1) The high speed at which material can be transmitted by an overhead telpher—500 to 700 feet per minute is quite ordinary practice—gives this machine a very decided advantage over all other types of conveyor.

(2) The working efficiency is very high, as the provision of a single rail for travelling the load upon, and with the provision of the direct lifting arrangement employed, the frictional losses can be cut down to a minimum.

(3) Comparing this system with, for example, any tray or bucket conveyor, especially where the material has to be first lifted to the conveying level, it is obvious that telpherage means a considerable saving in the power bill.

(4) As to the actual power required, it may be safely accepted that the cost of power to work a telpher is not more than half that required to work a bucket or tray conveyor. This has been proved by records taken over long periods and by individual tests. It has, for instance, been found that for a retort-house telpher handling hot coke in 35 cwt. gross loads, at a 30-feet height, and a 600-feet travel, the current consumption per working cycle was about 0·2 B.T.U., or under 0·12 B.T.U. per ton.

At a recent test made by the author on the plant under his charge 531 tons of coal were shifted over an average run of 300 feet, at a 20-feet lift, at the expenditure of 105 B.T.U., or under 0·2 unit per ton of material handled. At the first glance this may appear rather at variance with the figure previously given in connection with the coke-handling plant; but in the latter connection the ratio of dead weight of grab to net weight of coal was approximately 1·25 to 1, while in the case of the coke-handling plant the ratio existing between the weight of the skips and the coke was 2 to 3 (approximately). Hence the higher consumption per ton of material handled.

### Maintenance.

It is intended at a later portion of this article to deal closely with the maintenance question; but it may be mentioned at this stage that much naturally depends upon the facility of access to the machine and the promptitude with which renewals can be carried out—as much indeed as upon the cost of the new parts required. The length of time which a plant is out of action for repair is an important item, apart from the actual wages charges. The interest on capital and depreciation charges goes on whether the plant is working or not, and should be booked against it at all times. Hence the cost of replacements, accessibility, and speed with which necessary repairs can be effected must all be taken into account when considering the total cost of maintenance.

Under average conditions the cost of renewal parts for a 35 cwt. machine may be taken at a maximum of £20 per annum; but records from many plants show a renewal cost far below this figure, which it may be suggested should be compared by interested readers with the cost of a new chain for a conveyor having the same capacity. These figures seem very low for a plant in heavy use; but it must not be forgotten that in a telpher plant all the wearing parts are visible and easily accessible, and consequently most of the wear that takes place can be seen and remedied by the application of the "stitch in time." The electric equipment of the mono-rail telpher is of the most robust character, and can be insured against breakdown at a nominal annual premium.

### Capital Cost.

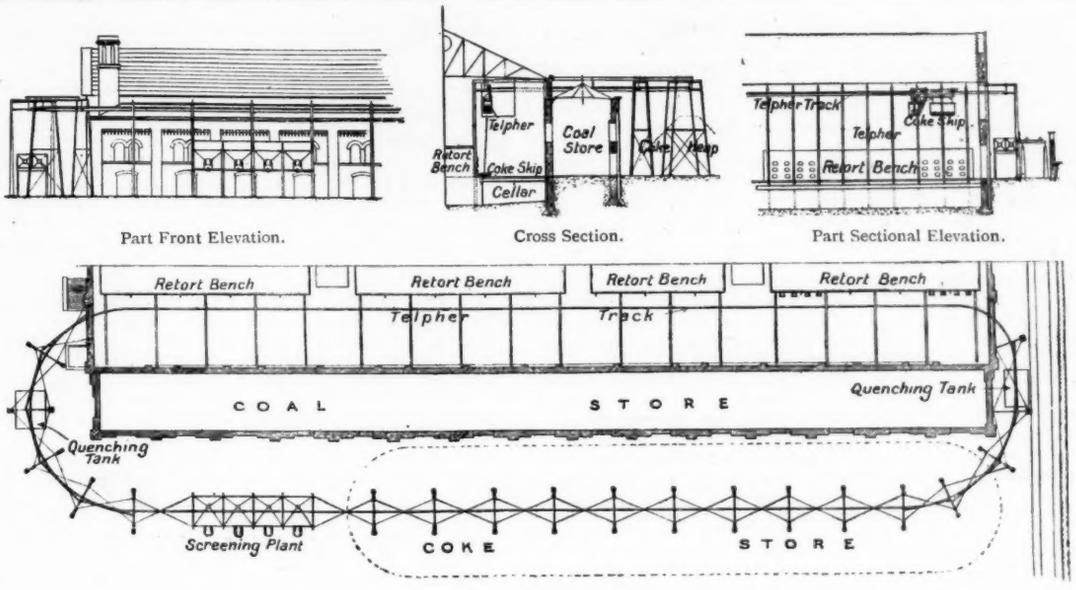
It is somewhat difficult to obtain a true comparison of the first cost of different installations, for the simple reason that it is practically impossible to find two different kinds of plant operating under exactly the same conditions. So far, however, as can be ascertained, after considerable deductions, allowances, and averaging, it may be said that there is not really much difference in the cost where the actual conditions are approximately equal.

To make a true comparison, it is necessary to take into account all the factors of which mention has already been made, and in many cases where a comparison has been made, and made in favour of the ordinary type of conveying plant, it may be found on closer investigation that some of the factors have been omitted, and that, for instance, the route over which the telpher is taking a load could not possibly be served economically by any other class of plant.

### Coke Handling.

It is proposed later to deal with the possibilities of the telpher for handling hot coke from the retort mouth to the quenching tank, and thence to the storage accommodation. Many of the reasons which give the telpher an advantage for this class of duty are common to any duty for which it may be employed—namely: (1) Low capital cost, (2) low maintenance, (3) small power required for driving, (4) all parts easily accessible, (5) simple construction, (6) capable of easy extension. In addition to these, the following are the peculiar advantages which make this machine particularly suitable for this class of work: (7) All working parts are removed from the action of heat and from the coke, (8) no interference with the drawing stage, which may be kept perfectly clean and dry, (9) no breakage of coke, (10) better working conditions in the retort-house.

Fig. 1 shows in plan a particularly complete arrangement in use at a large English gas-works. The telpher track forms a continuous loop, passing over the discharge side of the retorts, over a quenching tank outside each end of the retort-house, and over




Part Front Elevation. Cross Section. Part Sectional Elevation.

Plan of Ground.

FIG. 1.—ELECTRIC TELPHERAGE CONVEYING PLANT FOR HOT COKE.

a screening plant. The track is supported by hangers at intervals of 15 feet; the supports being close, to give ample support. The hangers are suspended from the underside of substantial box-girders, which are arranged in long spans for the purpose of limiting the number of necessary stanchions and keeping the coke yard as clear as possible.

### Points of Difference between the Mono-Rail and the Bottom-Flange Systems.

*Speeds.*—The standard speeds for mono-rails vary from 500 to 700 feet per minute; while the speeds attained with the bottom-flange system rarely exceed 400 feet per minute—the usual run being 250 to 300 feet per minute. In this connection, it may be said that, where the conditions permit, speeds of from 800 to 1000 feet per minute can be attained with the mono-rail system. For the same load and speed the power required to propel a transporter working on the bottom-flange system will be found to be nearly three times as much as that required in the case of the mono-rail telpher.

*Wheel Mounting.*—In the design of the top-rail machine, each wheel axle is provided with a roller bearing on each side of the wheel; the bearings in the case of machines up to the 3-ton size being 2 inches in diameter and 5 inches long. With the bottom flange system the wheel bearings can only be of a very limited area—usually about 1¼ inches diameter by 2 inches long—on account of the forced use of short overhung axles; while these axles are very badly placed for strength. With the mono-rail system, it will be seen that the axles are mounted as beams and are in double shear—there being a bearing at each end; while in the bottom-flange system the axles may be likened to cantilevers, and are mounted in single shear.

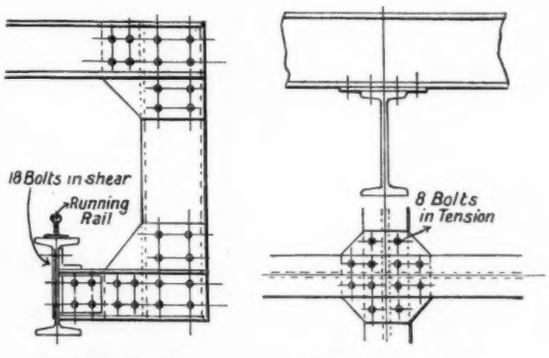
*Curves.*—In the case of the mono-rail telpher system, very small curves can easily be negotiated; the combination of the single rail and the free swivelling bogie ensuring perfect freedom and steady travelling, even on curves of small radius and with heavy loads. With bottom-flange working, sharp curves have necessarily to be avoided, as it will be seen that when taking a curve the inside wheels are bound to slip, on account of the linear speed of the machine on the outer path of its travel being greater than it is on the inner path. In this respect, it may be pointed out that a differential gear, such as is used on motor-cars, would seem to be necessary. There is naturally a great deal of grinding in the bottom-flange curved track even with moderate loads; but when the general working conditions are severe, as they almost always are in gas-works, the curves are likely to cause considerable trouble on this system. Sometimes running rails are applied to the inside of the flanges on this system; but these are difficult to renew, while the flange is always considerably weakened by the necessary bolt holes.

*Method of Supporting the Tracks.*—In the case of the top-rail system, the top of the track has to be used for the running rail. It is consequently necessary to use an entirely different method of supporting the track from that generally used for the bottom-flange track; the latter being simply bolted up to its supporting girders through the top flange. The top-rail track is supported by the web, leaving the top flange clear for the rail, and the bottom flange clear of all obstruction in order to give the necessary running clearance. Distinct structural advantages accrue from the practice of supporting the track from its web and not from its flanges, among which may be mentioned—

(1) A liberal support may be given without appreciably weakening the track—conditions which cannot be avoided if the track is supported by the flange.

(2) In the case of the mono-rail track, the bolts or rivets are in shear instead of in tension as they are in the bottom-flange track.

Fig. 2 shows the two distinct methods of supporting the mono-rail track and the bottom-flange track; and it will be seen that the conditions of loading the two tracks vary greatly. In the case of the bottom-flange track, the load is applied on the inside of the two flanges; and when the machine is travelling on a curve, unequal loading is bound to occur on the two flanges, owing to the tendency of the outer wheels to lift, due to centrifugal force, which puts a twisting strain on the track. Like conditions also arise when the machine is exposed to windage.




Mono-Rail System. Bottom-Flange System.

Fig. 2.

In the mono-rail system, on the other hand, the load is applied centrally at the top of the track rail—thus avoiding local flange stress and wear and tear on the track flange. When taking a curve, the action due to centrifugal force is just as apparent as with a bottom-flange machine; but in this case the load is not thrown on one flange. The point of application of the load is not appreciably altered from static conditions, and the line of "hang" of the machine is only diverted slightly from the centre line of the track, and there is practically no twisting strain set up on the track due to centrifugal force or windage.

*Wear and Tear.*—As regards comparative wear and tear, the main difference occurs on the travelling wheels and track; and from the description given above, and by comparing the driving powers necessary in the respective cases, it will be evident that there should be a considerable saving in the cost of renewals on the mono-rail system. On the mono-rail system the wear and tear on the track rail is very easily made good; the single bulb rail used being simply clipped to the top flange in convenient lengths of about 20 feet. In the bottom-flange system, it is either a case of renewing the running girder bodily, or where inside running strips are used two special strips to suit the taper of the flange have to be drilled, countersunk, and fitted to the bottom flange of the running girder. Apart from the question of the curves, the wear and tear on all parts of the track is much greater than with the mono-rail system.

With regard to the wear and tear on the hoisting gear, this is approximately the same where similar arrangements of gear are used. It should be noted, however, that with the direct-lift system

there are no intermediate rope wheels between the lifting barrels and the load; and this, combined with the absence of reverse turn in the rope, conduces to a much higher efficiency than the older arrangements.

*Cost.*—Both the mono-rail machine as well as the track on which it runs are more costly than the machine and track on the bottom-flange system, chiefly by reason of the special arrangement of hangers which are necessary to the proper suspension of the running track. It must not be forgotten that every change in the load requires special designing in order that the balance may be kept. Any material change in the electrical equipment necessitates special consideration for the same reason.

It will, of course, be seen, from the nature of the mono-rail system, that the whole weight of the machine and its load must be absolutely balanced about the centre line of the track; otherwise the machine will hang out of plumb. This necessity for accurate balance is the chief contributor to steadiness and safety of running at high speeds and under heavy loads.

Summing up, it may be said that the mono-rail system is one which must naturally appeal to an engineer. By its means he can practically encircle any portion of his works in a truly mechanical manner and carry out his conveying at a minimum cost; while the mono-rail telpher readily lends itself to extension and to the keeping pace with those changes which are inseperable from any works in a growing district.

*(To be continued.)*

## COKE-OVEN PRODUCTION IN AMERICA.

**[From the "Iron and Coal Trades Review."]**

According to the advance statement issued by the United States Geological Survey, the production of coke in the United States in 1914 was 34,555,914 net tons (2000 lbs.), valued at $88,334,217. Of this, 23,335,971 tons were made in beehive ovens with an almost total loss of the bye-products, and 11,219,943 tons, or 32·5 per cent., were produced in bye-product ovens, with a recovery of more than $17,500,000 worth of bye-products, or approximately $1·55 for each ton of coke. At the end of 1914 there were 99,755 ovens in the States, of which 5809 were bye-product ovens and 93,946 were beehive. Of the bye-product ovens, 667, or 11·5 per cent., were idle throughout the year, and 44,450, or 47·3 per cent., of the beehive ovens were idle. At the end of 1914 there were under construction 644 new bye-product ovens and 605 new beehive ovens. During the year 71 bye-product ovens were abandoned, all of which it is expected will be replaced by others of the retort or distillation type, and 3603 beehive ovens were also abandoned.

The following table shows the development of production during the period 1880 to 1914:—

| Year. | Ovens. | | Coke Produced (Net Tons). |
|---|---|---|---|
| | Built. | Building. | |
| 1880 | 12,372 | 1159 | 3,338,300 |
| 1890 | 37,158 | 1547 | 11,508,021 |
| 1900 | 58,484 | 5804 | 20,533,348 |
| 1910 | 104,440 | 2567 | 41,708,810 |
| 1911 | 103,879 | 2254 | 35,551,489 |
| 1912 | 102,230 | 2783 | 43,983,599 |
| 1913 | 102,650 | 1321 | 46,299,530 |
| 1914 | 99,755 | 1209 | 34,555,914 |

The following table shows separately the production of beehive and bye-product coke in the States over a series of years:—

| — | Bye-Product Coke. | | Beehive Coke. | | Total. |
|---|---|---|---|---|---|
| | Net Tons (2000 Lbs.). | Per Cent. of Total. | Net Tons (2000 Lbs.). | Per Cent. of Total. | Net Tons (2000 Lb .). |
| 1893 | 12,850 | 0·01 | 9,464,730 | 99·99 | 9,477,580 |
| 1901 | 1,179,900 | 5·41 | 20,615,983 | 94·59 | 21,795,883 |
| 1907 | 5,607,899 | 13·75 | 35,171,665 | 86·25 | 40,779,564 |
| 1908 | 4,201,226 | 16·14 | 21,832,292 | 83·86 | 26,033,518 |
| 1909 | 6,254,644 | 15·91 | 33,060,421 | 84·09 | 39,315,065 |
| 1910 | 7,138,734 | 17·12 | 34,570,076 | 82·88 | 41,708,810 |
| 1911 | 7,847,845 | 22·07 | 27,703,644 | 77·93 | 35,551,489 |
| 1912 | 11,115,164 | 25·27 | 32,868,435 | 74·73 | 43,983,599 |
| 1913 | 12,714,700 | 27·46 | 33,584,830 | 72·54 | 46,299,530 |
| 1914 | 11,219,943 | 32·50 | 23,335,971 | 67·50 | 33,555,914 |

In some factories in the United States, the practice is being adopted, says "Popular Mechanics," of painting all machinery with a white oil-proof enamel. The ceilings are painted with the same material whenever possible, so as to facilitate the use of indirect lighting. It is stated that the light reflected from the machinery is most valuable in eliminating inconvenient shadows and diffusing the illumination. In one case, it was found possible to take a photograph in a workshop of this kind in one-seventh of the exposure that would have been required had ordinary unpainted machinery been used.

## METHODS OF UTILIZING LIGNITE.

**Gas Making and Bye-Products.**

With a view to the adoption of better methods of utilizing the vast quantities of lignite, or brown coal, which exist in Southern Saskatchewan, the Government of the Province some time ago set on foot investigations; and a report has been submitted to the Highway Commissioners of Regina by Mr. S. M. Darling on the work carried out by him in connection with the matter during last year. The methods dealt with in the report are the utilization of the lignite by way of drying, carbonizing, and briquetting it; and experiments have been made to determine its value as a source of power, domestic and furnace fuel, and hydrocarbon and ammonia bye-products.

It appears from the report that the quantity mined annually in Saskatchewan has aggregated about 200,000 tons for several years. Despite the large increase in population, the output does not increase. Indeed, of late, there has been a slight decrease. This falling off in tonnage is due entirely to the encroachment upon the lignite territory of eastern and western coals. The reason the lignite is not able to hold its own is found in some of its physical characteristics. A large number of samples tested averaged:

| | Per Cent. |
|---|---|
| Moisture | 26·13 |
| Volatile hydrocarbons | 28·11 |
| Fixed carbon | 38·16 |
| Ash | 6·86 |
| Sulphur | 0·74 |

The large percentage of moisture has not been absorbed from extraneous sources, but is the portion remaining from the great amount of water present in the peat from which the lignite was formed. The necessity for the evaporation of this water in the furnace is, of course, an enormous handicap on the fuel. When lignite is mined and exposed to warm air and sunlight, the evaporation of the water causes the coal to disintegrate or slake very rapidly. It also fires very quickly from spontaneous combustion; hence it is not practicable to ship it long distances or to store it; Its light gases distil before the fixed carbon reaches the temperature of ignition, and, in the ordinary furnaces, escape unconsumed. The lignite has no "coking" quality whatever, and when thrown on to the fire crumbles very quickly, giving rise to difficulties in firing and substantial loss through the grate-bars. The fact that the percentage of sulphur is small is a good feature. There is an almost entire absence of the corrosive acid resulting from the combination of sulphur with water when lignite is burned. Further, should lignite gas ever be used as a town gas for heating, cooking, and illuminating purposes, there will be almost no sulphuretted hydrogen to be removed by means of hydrated oxide of iron purifiers.

### CARBONIZED LIGNITE.

After dealing with the burning, drying, and briquetting of lignite, Mr. Darling devotes attention to its destructive distillation, so as to extract all the volatile matter naturally contained in it, and utilize the resulting gas, ammonia compounds, liquid hydrocarbons, and residual carbon or coke in the various ways for which they are best adapted. Here it is remarked that the problem of an efficient lignite carbonizing oven has not been an easy one to solve. Elaborate and very efficient devices have been evolved to carbonize or coke bituminous coal. In all of these, however, the work is done at high temperatures, to get a large yield of gas, rather than at low temperatures, with a view to an increased amount of hydrocarbon bye-products. Then, too, because of the fact that bituminous coal cokes, very different apparatus is necessarily needed to handle it from that required for lignite, which has no coking or intumescing quality whatever; but, instead, it crumbles during carbonization.

Brief reference is made to early efforts to carbonize lignite, beginning about thirty years ago, and continuing to 1907, when the Laclede Gas Company, of St. Louis, equipped an experimental bench of four retorts, in which some Arkansas lignite was carbonized under Mr. Darling's direction. The object of this test was to determine whether or not the gas was of sufficiently good quality to be used as illuminating gas in the city. It was found, however, the report continues, that the gas contained a very large percentage of carbon dioxide—about 16 per cent. by volume. This almost entirely destroyed the value of the fair percentage of illuminants present. The following is a comparative analysis:—

| | Lignite Gas. Per Cent. | | Coal Gas. Per Cent. |
|---|---|---|---|
| Carbon dioxide | 15·9 | .. | 1·34 |
| Illuminants | 3·5 | .. | 4·42 |
| Oxygen | 0·2 | .. | 0·03 |
| Carbon monoxide | 19·5 | .. | 6·75 |
| Methane | 16·1 | .. | 34·60 |
| Hydrogen | 43·9 | .. | 50·19 |
| Nitrogen | 0·9 | .. | 2·67 |
| — | — | | — |
| Candle power | 3·2 | .. | 16·00 |
| B.Th.U. per cubic foot | 440·0 | .. | 630·00 |

While the lignite gas, therefore, has little illuminating value when burned as an open flame, it gives good results when burned in a mantle, and is very serviceable for fuel and power in furnaces and gas-engines.

The work with these two benches of horizontal retorts showed

conclusively that if lignite is to be carbonized on a large scale, some different type of apparatus must be used. These retorts were, of course, always kept at a high temperature; but even then the process was too slow. When one charge was carbonized, the end door was opened, and the residual carbon raked out. This was red hot, and in a more or less fine state of division. It burned immediately upon contact with the air; and water thrown on to the hot pile would not penetrate the mass as in the case of bituminous coke. It was necessary to almost saturate the material before it could be handled. It was plain that this carbon must be discharged from the retorts mechanically, and kept out of the air until cooled to the point at which it would not burn.

Again, in carbonizing the liguite, it is desirable that as large a yield as is possible of the hydrocarbon bye-products be obtained. This necessitates that the lignite must not be subjected to a high temperature till most of the volatile matter has been distilled. Of course, throwing the lignite directly into a red-hot retort, as is done in coal-gas practice, produces a larger volume of gas and a smaller yield of oil or tar. If the retorts were kept at a much lower temperature, there would be a larger yield of oil and a smaller volume of gas. But this would make the process so slow as to be unprofitable. The fact that the lignite crumbles on being carbonized makes possible a continuous carbonizing process—thus obviating the laborious and expensive charging and drawing of retorts, as practised in coal-gas plants.

Following the work in St. Louis, therefore, Mr. Darling built a carbonizer in Chicago, the essential feature of which was an inclined, slowly rotating, cylindrical iron retort, 14 inches diameter and 15 feet long. This cylinder passed through a stationary combustion chamber; the highest temperature being maintained at the lower, or discharge, end of the retort, and the flue gases escaping at the upper, or feed, end. The motion of the retort drew the lignite continuously out of a hopper at the upper end, and discharged the carbonized material into a cooling device at the lower end. As the lignite passed through this rotating retort, it encountered a gradually increasing temperature, until it was finally discharged red hot into the cooler. This resulted in a large yield of oil or tar, averaging upwards of 20 gallons per ton of Arkansas lignite. While this was an efficient type of carbonizing device, the iron retort deteriorated very rapidly under the high temperature. There are also many mechanical obstacles in the way of constructing and operating a large installation on this plan.

There was then built a third carbonizing oven, using as retorts vertical cast-iron tubes, the lower portions of which were protected with fire-clay tile. Here, too, the maximum temperature was at the bottom—the flue gases escaping at the top. Continuously fed and discharged, this also gave the essential progressive carbonization, and did the work satisfactorily in every respect. In operating this oven, lignite from Williston (North Dakota), was used, which is in all respects like the Saskatchewan product.

### The Saskatchewan Experimental Oven.

Ultimately, the Saskatchewan Government commissioned Mr. Darling to erect and operate at Estevan a small lignite carbonizing and briquetting plant. The idea was not so much to do fine-drawn laboratory work, as to actually treat the lignite on a sufficiently large scale to be able to use the products in every-day commercial work.

The carbonizing bench erected may be described as a vertical chamber oven. In principle, it is the same as the large horizontal bye-product chamber ovens, which are the most efficient devices for the coking of bituminous coal, except that it is vertical instead of horizontal, and is charged and discharged continuously instead of intermittently.

The lignite is unloaded from the cars into a bin in the bottom, and extending the whole length of the building, passed as required through the crusher, elevated to the top of the oven, and distributed to the several retort sections. It passes down through, and is discharged red hot from, the bottoms of the retort sections into a hopper, from which it is conveyed and elevated to the screen, which separates it into three sizes and deposits them into their respective bins above the raw lignite bin. The discharge hopper, conveyor trough, elevator leg, and the bins are kept charged constantly with exhaust steam from the gas-exhauster engine. The lignite carbon or coke is therefore kept in an atmosphere of steam until it will not burn on exposure to the air. The portion that is briquetted need never get cold.

The inside dimensions of the oven are 8 feet by 9 ft. 7 in. by 12 feet high. The rectangular retort sections are 12 feet high, 6 inches wide, and 8 feet horizontally, and alternate with series of combustion flues. Each layer or column of lignite is 6 inches thick, and has a heating flue on either side of it. Thus the heat is driven into the midst of the slowly descending body of lignite. The retort sections hold in the aggregate 4 tons of lignite; and the oven carbonizes 24 to 36 tons of raw lignite per 24 hours.

The gas generated in the retorts is withdrawn by an exhauster, and passed through cooling and washing apparatus, where the hydrocarbon and ammonia compounds are precipitated, and then on to the gas-burners located at the bottoms of the retorts. The flue gases are discharged at the top of the bench.

It will be noted that the lignite starts at the top of the retorts under a low temperature. As it descends slowly, it encounters a gradually increasing degree of heat, until it is discharged from the bottom of the oven red hot. The essential feature of this type of oven is that of progressive distillation—passing the lignite gradually from an atmospheric temperature to a zone of red heat. This results in the same substantial increase in the yield of hydrocarbon bye-products obtained when carbonizing at low temperatures, and yet the work can be carried on with the same speed as is possible with a high degree of heat. The entire process is mechanical.

The lignite carbonizes much more readily than bituminous coal. The most rapid evolution of lignite gas is given off between 700° and 900° Fahr. The gas is practically all off at 1000° Fahr. On carbonization, the products, in round figures, are:

| | |
|---|---|
| Gas per ton of lignite | 10,000 cubic feet |
| Oil or tar (water free) | 15 gallons |
| Ammoniacal liquor | 65 gallons |
| Carbon residue | 955 lbs. |

These are the proportions obtainable in good commercial practice. In the laboratory tests, the yields of gas exceeded 11,000 cubic feet per ton, with practically no increase in the amount of tar, as the last 1000 cubic feet of gas contains very little condensible hydrocarbon.

### The Gas.

The heating value of the gas averages above 400 B.Th.U. per cubic foot. As remarked earlier in the report, it is not good illuminating gas, unless burned in a mantle, but makes a good town gas for heating and cooking, and is very serviceable for industrial fuel and power in furnaces and gas-engines.

There is more gas in a ton of lignite than is required to carbonize the next ton. In practice, only sufficient gas would be removed to supply the requisite fuel to carry on the carbonizing process, the remaining portion being left to add heating value to the carbon residue; or all may be extracted, and the surplus used in a gas-engine to generate power, or for burning tile, pottery, brick, &c. Or the entire yield may be so used, or sold as town gas, and the carbonizing carried on by means of lignite producer gas. About 6000 cubic feet of the gas yield per ton is required to carry on the carbonizing—leaving a surplus, costing nothing, of 4000 cubic feet per ton to be used for power. This 4000 cubic feet of gas, of 400 B.Th.U. per cubic foot, yields 1,600,000 B.Th.U. The average gas-engine uses 10,000 B.Th.U. per horse-power-hour, which gives 160 horse-power-hours from the surplus gas per ton of lignite carbonized.

### The Oil or Tar.

There is not the large yield of oil or tar from the Saskatchewan lignite that there is from the lignite mined near Lester, Arkansas. On distillation, the fractions are:

| | Per Cent. |
|---|---|
| Light oils, benzene, &c. | 11·5 |
| Carbolic oils, some naphthalene | 13·5 |
| Creosote oils | 34·1 |
| Anthracene oils, some paraffin | 16·4 |
| Pitch, hard | 24·5 |

### The Ammoniacal Liquor.

There are about 15 lbs. of sulphate of ammonia per ton of lignite. It is easy of recovery, by passing the gas, after the tar has been extracted, through a sulphuric acid solution. Ammonium sulphate crystallizes out, and is raked-out and dried, when it is ready for the market.

### The Carbon or Coke.

When carbonized, the lignite is practically charcoal. It has about the same analysis as anthracite, and has about the same heating value; but it is not so dense in structure, and therefore has more bulk per ton than anthracite. After passing through the carbonizing bench, the lignite is screened into several sizes. The dust and smaller sizes must be briquetted; the larger lumps, somewhat above the size of "pea" anthracite, are available for use in gas-producers for the production of power.

The use of carbonized lignite in gas-producers, for generating gas for fuel purposes, is then considered; the remark being made that it constitutes an ideal gas-producer fuel. The amount of gas is equal to that from anthracite, pound for pound; but the gas is richer, it has less tar and clinker, and burns more freely.

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**Entertainments at the American Gas Institute Meeting.**—Mr. George G. Ramsdell, the Secretary of the American Gas Institute, writes in regard to the meeting at San Francisco next month: The entertainment provided will be ample and thoroughly Californian. Among the things tentatively arranged will be a President's reception and ball on Monday evening, Sept. 27; and this will be followed throughout the week by a round of pleasures—including an automobile trip for the ladies through Golden Gate Park, with a luncheon at the Cliff House, returning through the Presidio to the exposition grounds. An afternoon will be devoted to "Gas Congress" day, with exercises at Festival Hall. There will be a presentation of a bronze medal to the President of the International Gas Congress by the President of the Panama-Pacific Exposition, and probably the paper on the "Illumination of the Exposition" by Mr. W. D'A. Ryan, who is the wizard who conceived the magnificent lighting effects of the exposition. A dinner and dance in the exposition grounds is contemplated, as well as a night on the Zone, and an evening devoted to special illumination of the exposition with fireworks in honour of the International Gas Congress. Special efforts will be made to entertain the ladies of the party—such as the inspection of some of the celebrated stores and trips to Chinatown.

# CORRESPONDENCE.

*[We are not responsible for opinions expressed by Correspondents.]*

## Coke-Oven Plants and Toluol Recovery.

SIR,—In your editorial reference of Aug. 17, after a highly appreciative reference to the endeavour of the "Yorkshire Post" to draw the attention of the Parliamentary War Savings Committee and of the public to the fact that our supplies of toluol, and therefore of the high explosive trinitrotoluene, depend largely on the consumption of gas, you say:

> The "Yorkshire Post" had a little fall in supposing that the coke-oven plant owners were not doing a good part in connection with the recovery of toluol; and there were protests from that quarter.

These protests, however, have elicited a valuable correspondence in the "Yorkshire Post," from which it appears that the coke-ovens are doing far less than they might, and should.

I may be permitted to quote a letter of which the expert authorship is not hidden by the fact that it appears merely over the initials "H. J. H." "H. J. H." points out that while, of 8348 bye-product coke-ovens tabulated in 1914, 6373 were fitted with plant to recover benzol and toluol, the great majority of coke-ovens in this country are beehive ovens, in which no bye-products are recovered. At the end of 1913, there were still in this country 13,167 beehive ovens, as against 7839 bye-product ovens.

It was only, as you said, "a little fall" which the "Yorkshire Post" suffered; and it is much softened by such testimony as that of "H. J. H." The inference, therefore, remains, that the existing state of things needs to be remedied, and that if the gas-works are not yet doing all they might in regard to the production of toluol, the coke-ovens, as a whole, are doing much less. The important thing, however, is not that the "Yorkshire Post" is shown to have been in the main correct, but that the conditions noted should be improved, and that the recommendations of the Parliamentary War Savings Committee, with a view to the highly needful inculcation of thrift, should be made with full knowledge of the consequences.

WRITER OF THE LEADING ARTICLE IN THE "YORKSHIRE POST."

*Leeds, Aug. 20, 1915.*

# REGISTER OF PATENTS.

## Production of a Liquid Fuel and Illuminant from Tar.

MARKL, A., of Prag-Zizkov, Bohemia.

No. 10,383; April 27, 1914. Convention date, May 2, 1913.

This invention aims at obtaining from tar itself, or from the fluid residue which remains after distilling off the benzene, toluene, and other light constituents, a product which, by reason of its properties, can serve as a substitute for mineral oil, both in heating and illuminating, and also for driving engines.

According to the process suggested, tar from any source—either as it is or after its light constituents have been distilled off—is allowed to stand at ordinary temperature mixed with a very weak aqueous solution of alkali—*e.g.*, containing from ½ to 1 per cent. of KOH—preferably warm and preferably with temporary mixing or agitation. Having regard to the fact that the substance treated contains at least 5 to 7 per cent. of phenols, the amount of alkali employed is insufficient to bring about their solution. In the process now patented, the mass separates into two layers—an upper aqueous layer and a lower tar layer. After the aqueous layer has assumed a light garnet red colour—which will be the case after a longer or shorter time, according to the concentration of the alkali solution—the tar is drawn off and subjected to distillation; and the light coloured oily fraction which distils over after the water and ammoniacal liquor at a temperature not below about 200° C., represents the new product.

The following is given as an example of the manner in which the process may be carried out. Into the vessel containing 100 parts by weight of crude tar—freed or not from the benzene, toluene, and other light constituents—is poured 100 parts by weight of a warm 1 per cent. solution of caustic potash. The tar is then mixed with the caustic lye, and the mixture is allowed to stand for six hours with temporary stirring or agitation. Immediately after the agitation, the aqueous layer on top shows a light red colouration, which deepens in tone in the further progress of the process. After cooling the tar layer, this is transferred into a distilling apparatus (of any known kind) of such a size that the contents do not rise into the receiver in consequence of the foaming which at first occurs by reason of the water contained in the distillation mass. After water has passed over at 100°, ammoniacal liquor distils over at 100° to 110°. If the temperature is then raised to 130° to 150°, the mass boils quietly; and at about 200° to 280°, after a little cloudy oil has first distilled off, the light coloured transparent oil distils over. This is suitable as a heating and illuminating oil.

In further characterization of the new product, the following particulars may be given. It shows a green fluorescence; is thinly fluid; smells little of tar; has a specific gravity of ·9997 at 15° C.; and 100 parts by weight of the oil contain 80·39 per cent. of carbon, 7·74 per cent. of hydrogen, and 11·87 per cent. of oxygen, nitrogen, and other substances. Owing to the fact that the oil contains together 88·13 per cent. of carbon and hydrogen, its heating value is extremely high—namely, 8313 calories. A further advantage of the oil is said to consist in the fact that, owing to its extremely small content of ash (0·005 per cent.), it burns almost without any residue in spray burners. It flashes at about 70° to 75° C.; and its fire test is about 110° to 115° C. It solidifies at about − 30° C.

## Obtaining Low-Boiling Hydrocarbons (Benzene Substitutes) from Bituminous Coal.

PLAUSON, H., and SCHRODER, P., of Hamburg.

No. 4340; Feb. 19, 1914.

This invention relates to the distillation of brown coal or lignite in the presence of liquid hydrocarbons for the purpose of obtaining benzene substitutes of low boiling point in a considerably larger proportion than hitherto.

In the dry distillation of brown coal or lignite, the patentees remark, it is known that approximately from 4 to 5 per cent. of liquid hydrocarbon are obtained, of which only a small fraction—approximately 2 to 3 per cent.—has as low a boiling point as 100° to 150° C. To obtain smokeless fuel in the form of coke or briquettes, slack coal has been mixed with (say) 10 per cent. of liquid hydrocarbons—such as gas tar—and heated in a coking chamber in the presence of air and steam, in order to remove its volatile contents, and to produce a dense, hard coal; or for the same purpose coal has been heated in a closed chamber in the presence of steam and alkaline salts; or briquettes have been made from coke dust mixed with a trace of a combustible (such as nitrate of potash) or with carbonate of potash and a small percentage of resin, coal tar, or other binding agent. The product in these cases is mainly gas suitable for heating or lighting purposes, whereas according to the present invention approximately 4 per cent. of the coal is converted into liquid hydrocarbons of low boiling point adapted for use as benzene substitutes—in other words, 100 parts of coal produce 4 parts of liquid hydrocarbons.

The process is as follows: 100 parts by weight of lignite are ground to powder (the fineness of cement) with 100 parts of hydrocarbons—such as crude naphtha, for example—in a drum mortar mill or similar apparatus. Approximately 3 to 5 per cent. of nitrate salts (alkaline earth or alkali salts) are then added to this mixture. The distillation that follows is effected by conducting air, heated to 1000° C., to a distillation chamber; the air being previously mixed with steam, so that the temperature is reduced to about 700° to 600° C. by the time the air-steam mixture reaches the distillation chamber. Simultaneously with this air-steam mixture, the coal treated with naphtha and nitrates is sprayed into the distillation pipe as in coal-dust firing, "whereby an instantaneous decomposition of the coal-naphtha mixture into hydrocarbon and simultaneous setting free of hydrogen take place." The vapours are condensed in some suitable cooling apparatus and fractionated in any known manner.

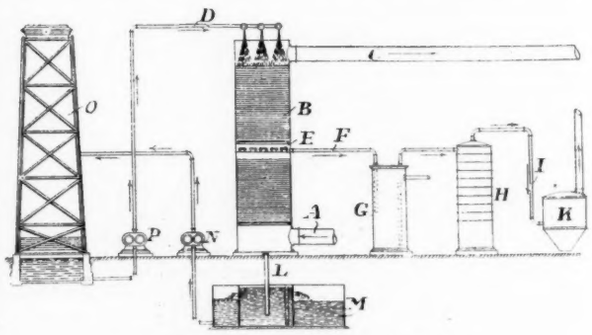
By the process described, approximately 4 per cent. of the coal and 18 per cent. of the crude naphtha employed are said to be converted into low-boiling (80° to 150° C.) constituents utilizable as benzene substitutes. The fractions distilled over at from 150° to 200° C. can be employed as turpentine substitutes; while the fractions distilling over above 200° C. can be treated to form heavy oils, or can be re-introduced into the cycle of operations mixed with coal and nitrates.

## Separating Tar and Ammonia from Gases.

DR. C. OTTO AND CO., G.M.B.H., of Bochum, Germany.

No. 12,818; May 25, 1914. Convention date, June 28, 1913.

According to this invention, the crude gases are cooled and washed with cold water sprayed in the direction opposite to that in which the gases move. In the words of the patentees, the cold water entering from above washes the tar from the gases flowing in the opposite direction, and absorbs more and more ammonia on its way downwards until it arrives at about the middle part of the washer. In the lower part of the apparatus, in consequence of the action of the hot gases, the volatile ammonia is expelled again from the washing water, so that the latter finally issues from the washer charged only with fixed ammonia compounds. There is, therefore, formed in the middle part of the apparatus a zone where the washing water has as high a content of ammonia as possible under the conditions; and if water is continuously




**An Otto Company Tar and Ammonia Washer.**

withdrawn from this zone at such a rate that the quantity of ammonia removed in it per unit time is substantially the same as is introduced during that time by the crude gases entering the washer, the process may be continuous. The water thus removed is separated from tar and led directly to a still to be further worked up in any known manner.

In order to avoid any loss of ammonia with the gases issuing from the upper part of the washer, there is arranged behind it a supplementary washer fed with a spray of cold fresh water, the quantity of which may be so measured that it corresponds with the quantity of water passed into the still, if the amount of water corresponding with that precipitated in the process is entirely evaporated on the cooling tower. The water running over the cooling tower becomes richer in fixed ammonia compounds; and as it is used again as washing water, a portion is

always conducted into the still with the water passing therein. "Both the volatile and fixed ammonia compounds are therefore recovered substantially entirely, except for unavoidable losses."

The main advantages of the process are: "Simple and cheap apparatus, smaller requirement of power as compared with the so-called direct process (as large saturators are avoided), less effluent as compared with the old indirect process, and less resistance in the apparatus."

The hot crude gases enter the washer B by the pipe A and leave through the pipe C. Through the pipe D cold water is sprayed into the gases from above, which water separates tar and ammonia from the oppositely flowing gases. At a middle zone E of the washer, the washing water possesses the highest content of ammonia; and from this place a part of the water is withdrawn through the pipe F. After separation of the tar in the tar-separator G, the water enters the still H, where it is distilled (in known manner, with the addition of lime), and the ammonia passes through the pipe I into the saturator K, wherein ammonium sulphate is formed.

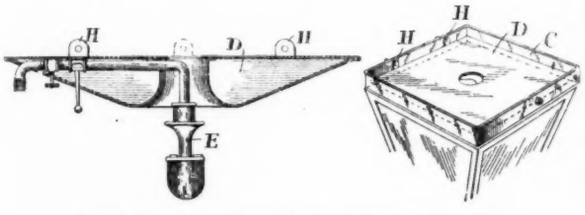
The hot water flowing from the bottom of the washer B through the pipe L is separated from the tar in the separator M, and the tar-free water is pumped by the pump N to the cooling tower O. Here such a quantity of water should be evaporated as corresponds approximately with the quantity introduced into the process by the coal. A part of the cooled water is continuously forced by the pump P back to the washer B. In the pipe C there is preferably inserted a supplementary washer [not shown], in which there is a spray of cold fresh water or acidified water, in order to separate the last traces of ammonia from the gases.

## Gas-Lamps.

BRITISH GRAETZIN LIGHT, LIMITED, and MEADS, H. J., of Chapter Street, Westminster.

No. 13,215; May 29, 1914.

This invention consists in the combination in a gas-lamp of a reflector with means for securing it in the lamp-casing comprising lateral projections on the reflector which engage perforations formed in the lamp-casing itself.




**Meads' (British Graetzin Light Company) Gas-Lamp.**

The illustration shows, in section, the general construction of the reflector, and a perspective view of a lamp with the top removed and the reflector inserted in position.

The particular feature of the invention is the means for securing the reflector D in place in the lamp-casing. It is provided at each edge with lugs H provided with pins extending laterally in a direction outwards from the reflector. When the reflector is to be mounted in the lamp casing, it is only necessary to form holes in the flanged portion C in positions corresponding to the pins.

The tube which supports the burner-mouth E extends from the centre of the reflector to one corner, and where bent over to pass through the reflecting surface is provided with a screw nipple connection. The gas supply pipe extends up the inside of the casing to connect with the burner-tube.

It will be appreciated, the patentees remark, that the invention provides simple means for converting a lamp from (say) an upright incandescent burner to an inverted burner, since all that is necessary is to punch three holes in the lamp-casing, insert the reflector, tighten up the fastenings, and connect the burner-tube.

## Producing a Gas-Tight Membrane.

DEUTSCHE GASGLUHLICHT AKTIENGESELLSCHAFT (AUERGESELLSCHAFT), of Berlin.

No. 14,230; June 12, 1914. Convention date, Aug. 6, 1913.

This invention relates to a gas-tight membrane (and to the process of producing it), consisting of oiled sheets or skins of micro-organisms (bacteria, hyphomycetes, &c.) produced by the accretion of micro-organisms on suitable substances—*e.g.*, wort.

The skins are first washed in water, and the superfluous water pressed out. They are then either treated directly with oil or are introduced into an emulsion consisting of oil and an albumen solution. Good results are said to be obtained by the use of linseed oil and animal glue.

In order to prevent the skins cracking, there should be added to the linseed oil a small quantity of non-drying oil—such, for example, as vaseline oil. The emulsion is preferably produced by adding to the substances used to form the emulsion a few drops of an alcoholic potash, linseed oil soap, and thoroughly stirring or shaking and heating the mixture—the addition of the soap producing a very fine emulsion. The flexibility of the skins is increased by adding to the emulsion some glycerine or, in order to avoid any hygroscopicity, a solution of a soft soap. After the skins have been oiled or have been left for a short time in the emulsion, they are squeezed and dried in the air.

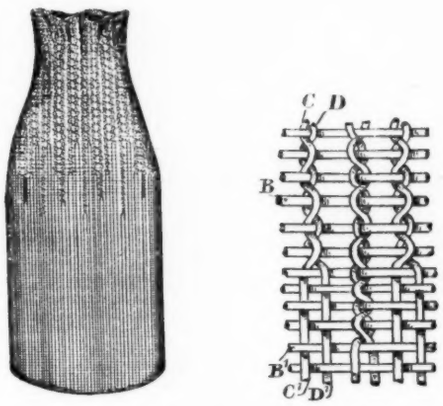
In order to produce thin and light membranes which, in spite of their thinness and weight, are gas-tight and strong, the skins, before being oiled or introduced into the emulsion, are subjected to a mercerizing process by means of alkalies.

## Mantle Fabric for Incandescent Lights.

GAREIS, O., of Berlin.

No. 16,046. July 6, 1914.

This invention has reference to an incandescent mantle, the head of which is made with greater qualities of resistance than the remainder, "as experience shows that the incandescent head, where the fabric is gathered in and on which the mantle hangs, is exposed to damage most easily inflicted, and it is at this spot where breakage of the mantle most frequently takes place."




**Gareis' Incandescent Mantle.**

An illustration is given of the method of making a mantle fabric of the kind referred to, and a portion on a larger scale of the fabric at the junction between the two kinds of fabric employed.

It is seen that every adjacent two-warp threads C and D are crossed or looped together, and the woof threads B pass through the loops formed by the crossed threads. In the lower or main portion, the fabric is a simple canvas or cambric one in which the warp threads $C^1$ $D^1$ lie straight and parallel to one another, and the woof threads $B^1$ pass through the warp threads from back to front and front to back.

A mantle made from this fabric has at its head, it is said, a capacity for resistance equal to that of a mantle made wholly from looped or gauze fabric; while at the same time it has, at the place which is of most account for lighting purposes, an illuminating power equal to that of a mantle made wholly from fabric of the canvas kind. "The fact that the incandescent head is made from a fabric which gives less illuminating power is no detriment, as it is known that the head of the mantle is of slight importance for the diffusion of light."

## Prepayment Attachments of Gas-Meters.

THORP, F., of Whitefield, and THORP, H. T., of Prestwich, near Manchester.

No. 18,313; Aug. 7, 1915.

This invention has for its object "to produce a mechanism whereby various sized coins may be used with the same apparatus and the equivalent amount of gas given." The invention can, it is said, be applied to various types of coin attachments, "the method varying slightly according to the different mechanical means employed in the attachment." The patentees do not claim the general principle of changing gears, but say that "hitherto no simple effective means applicable to modern attachments of doing this have been employed."

Figs. 1 to 6 [p. 460] illustrate devices for conveying the movement of the meter to the attachment so that the valve can be closed at rates corresponding to the value of the coin used. Figs. 7 to 10 show devices which may be employed to cause the coin, of whatever size it may be, to move a toothed wheel (which causes the valve to open) one tooth for each coin.

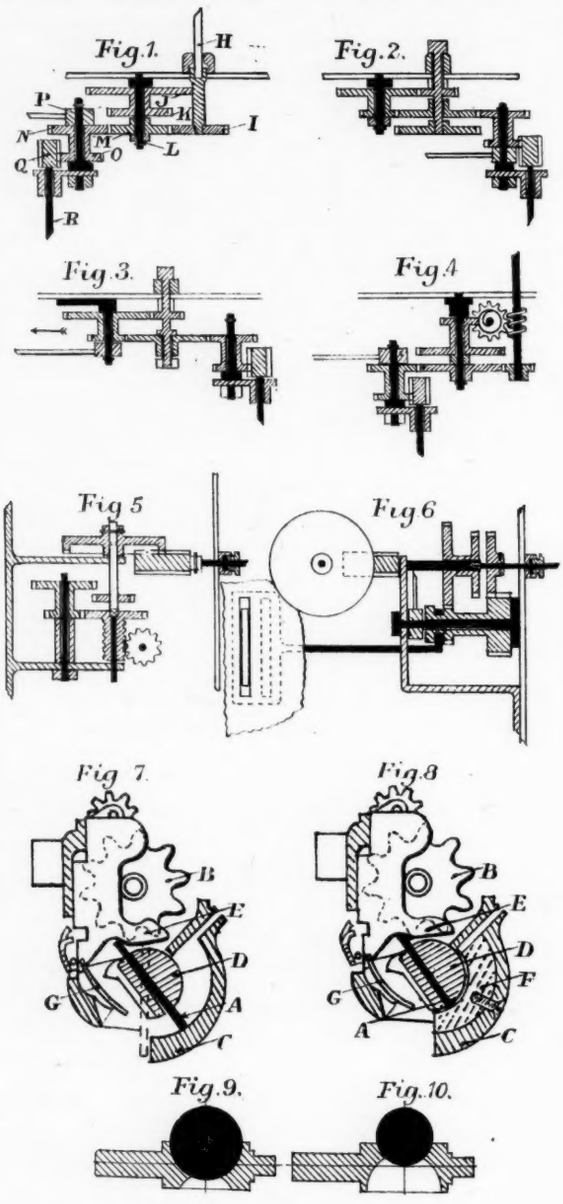
For the purpose of illustrating the action of the invention, they describe the arrangement adapted in one form to patent No. 20,991 of 1912, when the coin actuates a toothed wheel to which is attached a crown wheel, which gears into a small pinion carried by a wheel actuating the valve arm. The coin moving the toothed wheel one tooth through the gearing opens the valve; while the meter, through the index and special gearing, moves the wheel (which actuates the valve arm) in the opposite direction, and so closes the valve.

They show how two coins—1d. and 1s.—can be used, and the corresponding value of gas given. In figs. 7 and 8, A represents the coin in the position of engaging with a tooth in the wheel B. In fig. 7 the edge of the coin opposite the point engaging with the toothed wheel is in contact with the guide C, which keeps the penny pressed against the tooth until it has moved the wheel one tooth. The penny will then have been turned to the position shown by the dotted line, and fall out of the carrier D, or be pressed out by the lever E. If in place of the penny a smaller coin were inserted—say, a shilling—the diameter would be insufficient for the edge to engage in the tooth wheel when the opposite edge was in contact with the guide C. They therefore employ (as fig. 8) a making-up piece F, such that the diameter of the small coin, *plus* the thickness of the making-up piece, are equal to the diameter of the large coin. This piece is loose, and can be affixed to the guide C by a screw or other suitable means when the small coin is to be used, and removed when the large coin is employed. To prevent the coins falling into the money-box before they have actuated the toothed wheel, a guide-piece G is arranged to catch the coin and guide it to the toothed wheel.

As the two coins cause the valve to open the same amount, irre-

spective of size or value, it is necessary that the meter closes the valve after a shorter or a longer period according to the value of the coin. In the case of a penny and a shilling, the valve must be closed at one-twelfth the rate when a shilling is used as would be the case when the penny is used. Fig. 1 shows one method of accomplishing this. H is the shaft actuated by the meter. It carries a pinion to which is attached a wheel I, gearing into the wheel J, which carries a wheel K. These latter wheels revolve on the shaft L; while the wheel M, which gears into the wheel I, also revolves on the shaft L. Wheels N and O are fixed together, and revolve on the shaft P—the wheel O gearing into the pinion Q. The shaft R, revolving in a carrier, carries the pinion Q and actuates the mechanism to close the valve.

For an example, the wheel I has 24 teeth; the wheel M, 24 teeth; the pinion of the wheel I, 3 teeth; the wheel J, 36 teeth; and the wheel K, 24 teeth. As wheels N, O, Q are common to each combination, it is only necessary to deal with those previously specified. As illustrated, the wheel N is actuated through the wheels M I, each having 24 teeth;




**Thorp's Prepayment Attachment for Gas-Meters.**

the wheels J K revolving freely on the shaft L. This arrangement is for use when the penny is employed. If, now, the shilling is used, the wheel N must revolve at one-twelfth the rate.

The making-up piece is removed from its position on top of the wheel N, and placed under the wheel O—this raising the two wheels; and while the wheel O still remains in gear with the pinion Q, the wheel N has become disengaged with the wheel M, and geared into the wheel K. The pinion of the wheel I, having three teeth, gearing into the wheel J, having 36 teeth, causes the wheel K, having the same number of teeth as the wheel M, to revolve at one-twelfth the rate of the wheel, which revolves freely on the shaft L.

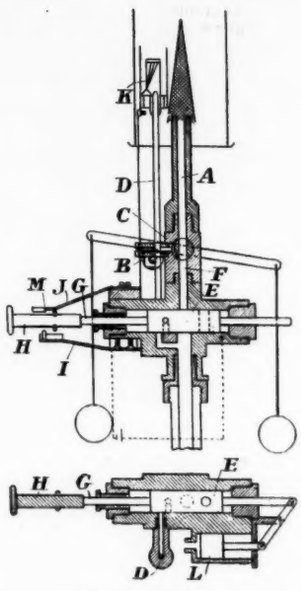
This description shows the application of the general principles of the invention; but, as previously mentioned, many devices can be employed to achieve the same object—see figs. 2 to 6—while in figs. 9 and 10 devices are shown to cause the coin, of whatever size it may be, to actuate the toothed wheel or other arrangement used to open the valve.

## Igniting Gas-Lamps.

RUKOP, A., of Brunswick, Germany.

No. 17,568; July 24, 1914.

This invention of a device for lighting gas-lamps, either at the spot or from a distance, consists in the provision of a pneumatically operated slide-valve which controls the gas supply to the burner and to a pilot-jet, and which, while supplying gas to the pilot-jet, closes an electric circuit for the ignition of the jet. The burner cock operates in the usual manner and feeds gas to the pilot-jet while the burner duct is closed.




**Rukop's Gas-Lamp Igniter.**

The burner shown consists of a tube screwed on to a cock casing, the duct of which is in communication with the duct A of the tube. The cock is operated in the usual manner by a double-armed lever with chains attached. As the lever turns, it depresses a spring-actuated stud B, the rounded head of which projects into the path of the lever. The stud retains the lever in both end positions and prevents accidental movement of the cock. The cock has a recess C, which, when the duct of the burner is closed, feeds gas to a pipe D leading to the pilot burner.

Underneath the casing a slide valve E is arranged at right angles to the duct F. The valve has two transverse ducts—one adapted to communicate with the pipe D, and the other with the duct F, when the position of the valve allows. One end of the valve E is connected to a rod (guided in a nut) which has its outer projecting end connected to a double-armed lever, the opposite end of which is connected to an air piston, through the medium of which the position of the valve can be adjusted. Another rod G, connected to the opposite end of the valve E, passes through a guide-bush adjustably held in a nut. The bush also serves as an abutment for the valve, the stroke of which can be regulated by its adjustment. Connected to the rod G is a cylinder H fitted with two contact-pieces, one of which is adapted, in a certain position of the valve, to engage contact pieces carried by resilient arms I J. A shoulder on one of the contact-pieces also forms an abutment, which, by engagement with the second of the contact-pieces named above, temporarily arrests the movement of the valve E. A wire connects the arm I with a battery; while the arm J is connected by a wire to a platinum filament K, which, when the circuit is closed, serves to ignite the pilot-jet.

Connected to the mouth of the cylinder of the air piston L is an air-pump, which may be placed at any suitable distance from the burner. When air is pumped into the cylinder, the piston will be moved to the right and the valve E to the left until the contact puts the ducts in communication and with the pipe D for supplying gas to the pilot-jet. At the same time the contact-piece moves, so that the circuit is closed and the pilot-jet ignited. A second actuation of the air pump forces the rounded contact past the shoulder M, so that the communication of the duct and contact-pieces is interrupted. At the second movement of the valve, however, the ducts are set into communication so as to feed gas to the burner.

Since the pilot-jet is only used during the short time required for lighting the lamp, no gas is wasted, it is pointed out, and the electric ignition element is at a sufficient distance from the heat zone not to be affected thereby.

When, for any reason, the ignition apparatus is not in use, the lighting and extinguishing of the lamp can be effected by means of the cock and the lever; the valve E being then set so that the ducts are in constant communication. In this case, the pilot flame will always be on when the lamp flame is off.

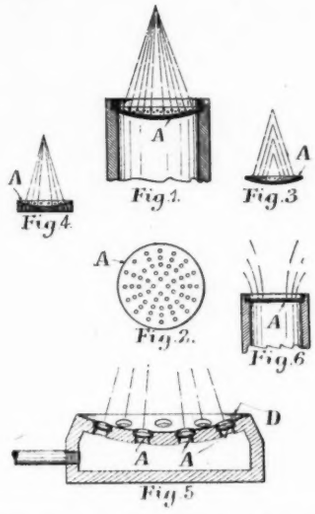
## Atmospheric Gas-Burners.

WALLWIN, J. M., of Salford, and SINNATT, F. S., of Manchester.

No. 19,073; Aug. 26, 1914.

The inventors claim, in burners for use in gas and air heated apparatus supplied with air at a pressure higher than that of the atmo-

sphere, and wherein the gas and air are intimately mixed before reaching the burner and are regulated to ensure complete combustion on issuing from the burner, the use and application of a diaphragm or disc with a multiplicity of perforations arranged so as to cause the streams of gas and air as they leave the burner to collectively converge, and, in conjunction with the air pressure, cause the combustible mixture to burn close to the disc and produce a short flame cone without the need of secondary air.




**Wallwin and Sinnatt's Atmospheric Gas-Burners.**

Fig. 1 illustrates a longitudinal section of the burner, with the disc in cross section. Fig. 2 is a plan of the disc only. Figs. 3 and 4 are transverse sections of modifications of the disc. Fig. 5 illustrates a vertical section of a compound type of burner for use with crucible furnaces. Fig. 6 is a longitudinal section of a burner nozzle fitted with the old form of disc (this view being intended to show, by the chain lines, how the gas and air spread out on leaving the disc).

In figs. 1 and 2, the disc A is made of thin sheet metal (steel) drilled with a series of concentric rings of holes formed while the disc is flat —before being pressed by dies to "concavo-convex" section. When fixed in the burner nozzle, the disc is arranged with the concave face outermost, constituting the delivery side. The gas and air are supplied to the burner under pressure (capable of regulation) and mixed in suitable proportions before reaching the burner. This "mixture issues from the holes in minute streams, which, owing to the arrangement and inclination of the holes, converge towards a common focus as shown." Further, with the air supplied under pressure, the flame cone is short; and "owing to the gas and air being intimately mixed, as usual before reaching the disc, the mixture burns close up to the disc, and no secondary air is required." The pressure of the air used would preferably be not less than 2 lbs. per square inch.

As shown in fig. 6, the disc is flat on its outer face, and the holes parallel to each other, with the result that the gas and air, on issuing from the disc and at the moment of ignition, become sprayed outwards, thereby causing portions of unburnt gas to escape into the atmosphere. This, at least from close observation, appears to be what takes place, the patentees remark; but whether the fact is as stated or not, the effect of inclining the holes towards each other (see fig. 1) is to prevent the escape of unburnt gas when the burner is used in heating pressing irons and the like, and also to increase the efficiency of the appliances.

The holes in the disc will preferably be all at right angles to the concave face of the disc, and thus converge towards a common focus. The inner rings of holes may, however, be formed at other than right angles to the face of the disc, and thus cause the streams of air and gas passing through them to converge at a point earlier than the streams passing through the outer ring of holes—see fig. 3. Instead of being made of metal, the disc may be made of steatite or the like, in which case it may be of the cross section shown in fig. 4.

In fig. 5, which shows the invention applied to a compound type of gas and air burner, the openings for the discs A are arranged in concentric rings and are inclined towards a common centre line. For this purpose the holder D is made concave on its top face, instead of flat. With the burner discs arranged in rings and parallel to the concave face of the holder, the several flames are said to collectively produce, or tend to produce, a single large, but comparatively short, flame cone.

## Hoisting Mechanism.

ROBERT DEMPSTER AND SONS, LIMITED, and HARGREAVES, W., of Elland, Yorks.

No. 23,408; Dec. 2, 1914.

This invention relates to hoisting mechanism for use in cranes, telphers, and the like, working with grabs, skips, &c., where auxiliary ropes or chains are required for opening the grabs or skips. Auxiliary ropes or chains have previously been operated by an auxiliary barrel; but, according to this invention, the auxiliary barrel is combined with the main barrel in the form of a sleeve mounted upon the main barrel and free to revolve on it; a frictional drive sufficient to lift the weight of the auxiliary rope or chain being imparted from the main barrel to the auxiliary barrel, which latter has an independent brake.

## Gas-Burners.

YATES, H. JAMES, and DAVY, J. F., of Aston, Birmingham.

No. 548; Jan. 13, 1915.

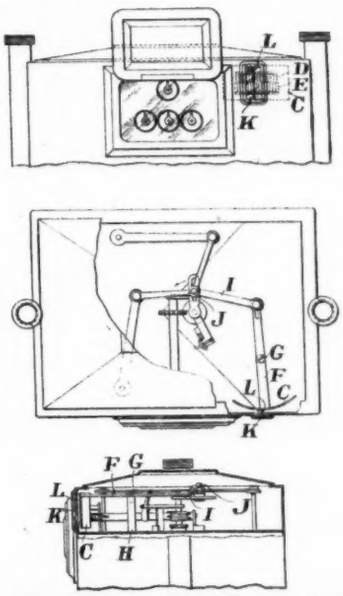
This invention relates to gas-burners employed in various forms of heating apparatus, and more especially to the burners used in conjunction with gas-fires. The object aimed at is to provide "an improved combined gas-nozzle and perforated tube for detachable insertion in the outlet aperture, or each of the outlet apertures, of a gas-burner." The invention comprises a tube closed at one end and formed with perforations closely arranged around its cylindrical part, and a nozzle which is secured to the open end of the tube and formed with an outlet aperture of smaller diameter than the tube. [Further particulars of the invention were given in the "JOURNAL," *ante*, p. 24.]

## Indicating Leakage in Gas-Meters.

METROPOLITAN GAS-METERS, LIMITED, and FORSTER, J. D., of Nottingham.

No. 4984; March 31, 1915.

This means for giving in a gas-meter visible indication of a leakage of gas comprises a scale (graduated into divisions representing consumptions of a fraction of a cubic foot of gas) designed to be moved in front of a fixed pointer in a window provided in the meter casing, "its movement being effected from the meter mechanism and being of such magnitude that an appreciably visible movement of the scale is indicated for even a slight leakage of gas."




**Forster's (Metropolitan Gas-Meters) Meter Leakage Indicator.**

C is the leak-indicating scale graduated by vertical division lines DE, of different colours in order to facilitate the reading of the movement of the scale—the divisions representing (say) 0·002 cubic foot. F is the arm which carries the scale at one end—being pivotally mounted at G upon a pillar H rigidly secured in the attic of the meter. Its other end is connected to one end of the link I, the other end of which is pivoted to the crank pin J, to which are connected the two links of the meter mechanism, and which engages a tangent in the usual way. K is the window in the meter casing behind which the scale is designed to be reciprocated; and L is a fixed pointer fitted vertically in the window.

Should there be any leakage in an installation provided with a meter as described, it will cause a movement of the scale C in front of the pointer L—the movement being of sufficient magnitude to be clearly visible even when the leakage is only slight; and as the divisions represent a predetermined quantity of gas, the extent of a leakage can be readily ascertained.

## APPLICATIONS FOR LETTERS PATENT.

11,826.—GWYNNES, LTD., and BREEZE, J. F., "Water supply." Aug. 16.

11,854.—SUTTON, C. J., "Gas-mantles." Aug. 17.

11,889.—HOLLY, C., and DRUCQUER, W. H., "Gas-fittings." Aug. 17.

11,909.—DONALDSON, J., "Conveyors." Aug. 18.

11,911.—GIBBONS BROS., LTD., and CLARK, F. W., "Regenerative chambers." Aug. 18.

11,937.—GLOVER, S., and WEST, J., "Discharging vertical retorts." Aug. 18.

11,942.—GLOVER, S., and WEST, J., "Discharging vertical retorts." Aug. 18.

12,068.—FLETCHER, RUSSELL, AND CO., LTD, and BANKS, W., "Gas-fires." Aug. 21.

The demand for glass goods of all descriptions in the Midlands continues very good. Flint-glass makers have received very important contracts for the supply of lighting glass during the coming autumn and winter; and there is considerable business in other directions. The export trade maintains fair proportions.

# MISCELLANEOUS NEWS.

## BRIGHTON AND HOVE GENERAL GAS COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held on Friday, at the offices, No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, M.Inst.C.E., the Chairman, presiding.

The SECRETARY (Mr. E. L. Burton, F.S.A.A.) read the notice convening the meeting; and the report [*ante*, p. 413] and statement of accounts were taken as read.

The CHAIRMAN proceeded to move the adoption of the report and accounts, prefacing what he had to say with the remark that he did not suppose any of the proprietors had attended the meeting in a very exacting spirit. Nevertheless, if any among them should have done so, he did not believe the keenest scrutiny and criticism would reveal anything whatever in the accounts which was not of a satisfactory character.

### A RECORD INCREASE IN SALES.

Dealing first of all with the report, it would be seen that there had in the half year under review been an increase in the sales of gas of over 50 million cubic feet, which was the largest increase that had ever been recorded in the history of the Company in connection with a single half year. It amounted to 6·8 per cent. And the succeeding figure in the report was really a corollary of the first; for it showed a very important increase in the receipts from residuals. Of course, this was mainly due to the larger amount of business done; but it was also partly due to an improvement in the price of the residuals sold. The report went on to indicate that, in common with most gas undertakings, they had been compelled to increase the price of gas; but he thought the proprietors would agree with him, as the consumers had done, that the increase, under all the circumstances of the case, was a modest one. It amounted to only 3d. per 1000 cubic feet; and, as far as the present accounts were concerned, the Company had only had the benefit of the increase since March, and therefore in the leanest quarter of the year.

### FIGURES WHICH ARE A CREDIT TO THE ADMINISTRATION.

There was brought to the aid of the present accounts from the previous half year a sum of £35,711; and after they had dealt with the various matters to which it would be his duty to call their immediate attention, they emerged with a carry-forward amounting to £36,613, which was a considerable increase. As a matter of fact, any increase whatever, at this time of trouble, must be a subject of congratulation, and of some credit to the administration of the Company. ["Hear, hear."] Turning to the accounts relating to capital, these showed that they had yet to issue over £130,000 of capital, when it might be required. Thus, they were still well provided for in this regard. The capital receipts totalled £703,378; and the important point about this figure was that it represented capital to the extent of £468 per million cubic feet of gas sold per annum—the lowest figure at which it had ever stood in the history of the Company. The proprietors had often heard him remark on these occasions that this figure was the most important one in connection with the accounts of a gas company. But, of course, they might have a very good figure of this kind in connection with a very bad state of affairs. They might have very little capital to issue, and very little land; and the plant might be in an unsatisfactory condition. Therefore the proprietors must consider, in connection with this figure of £468 per million cubic feet of gas sold, that the Company had very ample assets in the shape of land, that the works were in first-class order, and that the distributing plant was thoroughly up-to-date and efficient. These were the things which went to give the figure its real significance as a matter of comparison. There had been expended upon new meters during the half year the sum of £2532, but at the same time, on the score of depreciation, there had been written off £2700; so that their position was slightly more favourable by a comparison of these two figures. As to the redemption of capital under the powers of their Act of 1910, it would hardly be expected that the Board would have exercised these powers in the circumstances of the half year now under review; and therefore the matter stood as it did before, representing a permanent reduction which it had not been possible to increase during the past six months.

### COST OF COAL AND FREIGHT TROUBLES.

Coming to the revenue account, which was the most important of all, because it explained how the results to which he had referred had been obtained, and determined their merits, it might be said that coal had only cost £1023 more, notwithstanding the very large increase in the output of gas. In fact, the cost per ton had only risen from 18s. 7¼d. to 19s. 1½d.; and this would clearly indicate to the shareholders that the full burden of the adverse circumstances by which they were surrounded had yet to be reflected on the accounts. It was characteristic of the gas industry that bad times did not declare themselves at once. For one thing, there was the question of contracts, which staved off the evil day. The burden, of course, had to come; but often it had to be met after the proprietors had forgotten all about the matter. He did not think they would be likely to forget the present misfortunes; but he wanted them to realize that, in the matter of the accounts, they had yet to face the gravamen of the war and its consequences as they affected the Company.

### ALLOWANCE FOR WEAR AND TEAR.

The items in the accounts dealing with maintenance and repair showed that the Company had extended the total to nearly 12½d. per 1000 cubic feet of gas. This made clear the all-important fact that they had not shown any profit which had not first been written-down to the fullest possible extent that might be required for the security and stability of the finances. He had only a few days ago been looking at the accounts of a very important Suburban Company, and saw that there was devoted to the same four items—namely, repairs and maintenance of works and plant, mains, meters, and stoves and fittings—only 8d. per 1000 cubic feet of gas. On this basis of finance, it was easy to get good results on revenue account; but the criterion of results was always what provision had been made for maintaining the efficiency of the plant, and whether there had been charged to capital things which might have gone to revenue. Of course, in their own case they might possibly have charged items improperly to revenue; but there were three Auditors, and anything which passed them there was no need to be afraid of. The 12½d. per 1000 cubic feet to which he had referred was a very good foundation for any profit; but there were other items also which needed to be considered in estimating merits. Bad debts had gone up £237; and it was, of course, past the ingenuity of any administration to keep bad debts down in these times. Then there was the question of the allowances to the dependants of the employees serving with His Majesty's forces. This amounted to £1392, which was a sheer addition to the account as stated a year ago. While dealing with this matter, he would like to say that, out of the total of 850 employees, 328, or 38 per cent., had joined the Forces. Now, the proprietors knew that the management did not select their men on the basis of military qualifications. Some were advanced in years, and others were young. Therefore it seemed to him that the percentage he had named was one of which the Company might very well be proud, whether as proprietors or as administrators. He was not including in this total men who were making munitions. The men he referred to were performing genuine service to their country by fighting at the front; and he was certain no proprietor would be desirous of curtailing the provision that had been made for their dependants.

### CONSUMPTION AND PRICE.

As to the other side of the account, he had already stated that the increase in the quantity of gas sold amounted to over 50 million cubic feet. But, again, this was subject to some qualification. They had lost in public lighting more than 14 million feet. That was to say, they had sold for this purpose 14 million cubic feet less than they did a year ago; so that in normal times the increase would have amounted to something like 64 million feet. That they were able to show the increase they did in business, was due to the fact that there had been a large incursion of population owing to the military precautions taken around their district. It had also been considerably aided by the fact that they were even now selling gas at the very moderate figure of 2s. 11d. per 1000 cubic feet, which was less by 1d. than the price at which the premier Company of London were selling; and they were doing this under circumstances very much less favourable to the production of cheap gas. He sincerely hoped that the moderate increase to which he had referred would cover them during the war. No one could be sure; but the Directors had good reason to trust that no further increase would be necessary. Rentals of meters, stoves, and fittings had increased £759. Although this was a small figure, it was very important. If it was possible to show a continuous increase in connection with meters, stoves, and fittings, this was one of the very surest indications of the progress of a company. With regard to the receipts from residuals, he might remark that the profit through sulphate from ammoniacal liquor, though they did not work-up this liquor themselves, amounted to £8 4s. per 100 tons of coal. This figure was adopted because it afforded a comparison with other companies; and it showed they were doing nearly as well in these times without works as other undertakings were doing with works. The total receipts on revenue account were £13,921 more, and the expenditure £6877 more. In the profit and loss account, it would be seen that they had paid out of net revenue £433 on account of the Act of Parliament they recently obtained. This was a small sum for an Act which embodied various useful provisions for the Company. The next item was £2952 written off the investments of the Company, and taken out of the revenue account. This was a bold course. Very many other companies would like to do the same, but could not afford to. Their Company, however, had done it, and yet had left themselves with an addition to the carry-forward afterwards. This writing-down related to the special purposes fund, which embodied the older forms of fund—the insurance fund, and so forth. The reserve fund had been written-down; but, of course, they could not charge depreciation in this way in revenue, because it dealt with money which had already become the property of the proprietors. It was merely a book entry, and showed that they carried forward to the reserve fund securities equal to a value of £57,902; and in order to reduce it to this figure, they had had to write £10,523 off the amount brought in to the half year. He thought this was an expedient course to take, because these were not times in which one would wish to put before the proprietors or the public figures which did not show an intrinsic value. The figure now complied with the minimum rates as fixed by the Government. The capital redemption fund was suspended in its operation. The benefit fund account showed disbursements during the six months amounting to slightly under £600, whereas the Company had made provision to the extent of £700. There was an accumulated amount of £2339 to carry forward; and this being on deposit at the bank, it was not subject to depreciation. In the balance-sheet, there was only one matter to which he need call attention. This was an item on the credit side of £79,674 for prepayment meter fittings, stoves on hire, &c. To meet this, there was in the capital account a balance of £64,450—not adequate in itself, but going a long way as a set-off to it. These were the figures on which the report of the Directors had been based; and he ventured to say they indicated a very sound state of affairs, and one which enabled them to look forward with some degree of confidence to the future. The bright spots were the facts that they had a continuation of the increase in business, that their contracts had been made on as favourable terms as those of any other company, and that they had made all possible provision to meet the difficulties that confronted them. But, nevertheless, the risks attaching to the conduct of the Company's business were abnormally great at these times. They were practically dependent for their coal supply on the water route from Newcastle to Shoreham; and it was quite unnecessary for him to enlarge upon the risks attendant upon the transmission of coal in this manner. They could not, however, avail themselves of any other method; and they had limitations imposed on them by the nature of the port through which they took their coal. Only a certain size of steamer would serve them; and it was this fact which gave rise to anxiety in the minds of the Directors. They had done everything in their power to obtain all the freight possible, so as

to increase their stock of coal against any evil day; and they had brought them up to what would be in ordinary circumstances an entirely satisfactory figure. Their sole endeavour, however, was to accumulate coal against any possible eventuality in the future.

The DEPUTY-CHAIRMAN (Mr. G. W. Carey) formally seconded the motion for the adoption of the report and accounts.

COMPLIMENTARY REMARKS.

Mr. H. E. JONES said the accounts reflected the greatest credit on all concerned. The feature which struck him most in connection with the Company was the extraordinary improvement in the financial aspect, due to the very careful way in which the business had been administered during the last fifteen or twenty years. He recollected the time when the capital represented nearly double the amount per ton or per million cubic feet of gas that it represented to-day. This showed that, not only had capital been wisely spent—which he should expect from such a careful engineer as Mr. Cash—but also that a statesmanlike policy had been pursued in the administration of the Company. He had been pleased to hear the Chairman say the Company's price was low, as compared with other larger and better situated concerns. This showed, again, that the political administration had been what it should be. He noticed with gratification that the expenditure on upkeep was very considerable. Whether or not he happened to be responsible for the Suburban Company to which the Chairman had referred, he did not know; but he thought any company spending 8d. per 1000 cubic feet on the items named did very well, and that any concern spending 1s. did (as the American said) "A darned sight better." He wished the circumstances of all of them admitted of such sound finance. Like all companies who had amalgamated and had had to shift their manufacturing works from one site to another, the capital of their Company was necessarily swollen for a good many years; and this was a matter of concern to Mr. Paddon's father when he occupied the chair. That gentleman would have been as delighted as he (the speaker) was to know that under the present Chairman's close and attentive administration, and that of Mr. Cash, things had so much improved. The Secretary had only one fault—that he was almost too particular. He heartily supported the resolution, and hoped that before the meeting separated the proprietors would unite in giving that hearty vote of thanks to the Directors and officers which they so thoroughly well deserved.

The resolution was then unanimously carried.

THE DIVIDENDS.

Proposed by the CHAIRMAN, and seconded by Mr. A. F. PHILLIPS, dividends were declared for the half year at the statutory rates per annum of 6 per cent. on the "B" and 4 per cent. on the "C" preference stocks, and 10¾ per cent. on the original and 7¾ per cent. on the "A" ordinary stock—all less income-tax.

VOTES OF THANKS.

The CHAIRMAN, in proposing a vote of thanks to the officers, said he knew perfectly well that all he had previously stated must have gone to show that both the Board and the proprietors were much indebted to them for the very favourable report which had just been adopted. He had omitted to mention that he had before him some interesting figures with regard to carbonization; but this omission was not to be regretted, for he was now in a position to give the information separately. The amount of gas sold per ton of coal carbonized by Mr. Cash and his staff was 13,141 cubic feet, and the gas unaccounted for was only 2·5 per cent. These two figures would stand well among others of the same kind; but they were not arrived at in any haphazard manner. They were the subject of very careful measurement, registration, and checking, and were absolutely to be depended upon. This being so, no higher compliment could be paid to Mr. Cash than was reflected in these figures. With regard to Mr. Burton, who Mr. Jones, in his happy way, had referred to as being perhaps too particular, the only thing he could say was that they liked him all the better for this. All they desired to do was to present a case which would successfully withstand the fiercest light of publicity.

Mr. DODGSON seconded the vote, which was heartily passed.

Mr. JOSEPH CASH, in reply, remarked that the results of which they had heard that day had been obtained with the loyal co-operation of everyone connected with the Company. As the proprietors were aware from the statement made by the Chairman as to the number of men who were serving the King, they had during the six months been very short-handed at the works. But it was not exactly the number of men that affected the matter, so much as it was that those who had gone were the best men. These had to be in some way replaced by men perhaps older, or not so well qualified to do their work. Now came the results of those who were left. They turned round and manfully filled the gaps, taking up duties which in some cases they had never performed before; and he was proud of what had been accomplished during this period of stress. They were also, every one of them, indebted to those who had gone to the front, and were serving the country in various ways. Fortunately, they had lost only two of them by death, and several wounded. The remainder he hoped would come back safe and sound when peace was restored.

Mr. BURTON also responded. He remarked that 40 per cent. of his staff had gone to serve their country; and he had had to take on untrained men in their places, which had made the work very much harder than was the case at other times.

The proceedings were brought to a close with a vote of thanks to the Chairman and Directors, which was accorded on the proposition of Mr. JONES, seconded by Mr. A. W. OKE.

**Stroud Gas Company.**—The report of the Directors of the Company for the last half year shows that the sales of gas per meter have increased 1,668,000 cubic feet over the corresponding period of last year, and that 68 new consumers have been added. To meet the increased cost of coal under the new contracts, the Directors have been obliged to raise the price of gas 3d. per 1000 cubic feet during the half year. The payment of the maximum statutory dividend of 5 per cent. per annum, less income-tax, is recommended.

## EASTBOURNE GAS COMPANY.

### The Annual Meeting without Dr. Jeffery.

The Annual Meeting of the Company was held on Monday of last week. In the absence of the Chairman (Dr. G. A. Jeffery, J.P.), Alderman J. C. TOWNER (the Deputy-Chairman) presided.

The CHAIRMAN, in opening the proceedings, said they must all feel very great regret at the absence of their venerable Chairman. He was not able to be present—not having fully recovered from the illness he had lately suffered from, and he thought it better under the circumstances not to attend. It was very painful to him (the Chairman) to have to take his place, because he believed he had occupied the position at the annual meetings for the past 55 years without a break. This was a great record. He proposed that an expression of the regret of all the stockholders at Dr. Jeffery's absence, together with an assurance of best wishes for his speedy return to good health, should be sent. The Secretary (Mr. Garrard) had a letter from Dr. Jeffery, which he would read, and then Mr. Garrard would give some details bearing upon the past year's working.

Mr. JAMES S. GARRARD, having read the letter from Dr. Jeffery, proceeded to give a statement explanatory of the Company's operations. In the course of it he said: In these war times we have spent as little capital as possible. Only £716 has been expended during the half year—mostly for meters and stoves. Our low expenditure of capital per million feet of gas made is, however, our best feature. In these hard times, it is a truism that low capital expenditure is one's salvation. The revenue account is a plain statement and tolerably easy to understand. Coals have cost over £5000 more than last year. In other words, they have cost us 26s. 6d. per ton, against 22s. last year. This increase of 4s. 6d. per ton adds to the cost of gas by 5d. per 1000 cubic feet. The war has brought other expenses upon us in the shape of a war bonus to the workmen who have stayed at home. Also payments to the wives and dependants of those who have joined His Majesty's forces. These amount to almost £1000 in the half year, and add nearly 1d. per 1000 cubic feet to the cost of the gas. A portion (£734) of these payments has, however, been charged to the "Special Purposes Fund." The extra cost of coal and additional payments to employees amount to about 6d. per 1000 cubic feet. But the officers of the Company have exerted themselves to effect economies in other ways; so that by good working and the greatest care in all the spending departments we have been enabled to restrict the increased charges for gas to 2d. from January to March, and an additional 2d. from March to June. Passing from expenditure to income, the growth of the Company's business is at once seen. A year ago the increased sales of gas were 2½ per cent. During the past half year the increase has been 7½ per cent.—equal to nearly 20 million cubic feet of gas. The military camp and various hospitals have doubtless assisted; but a general increase all round appears to support the view that dear fuel, and the prolonged periods of dullness and darkness, have contributed to a remarkable increase in the sales of gas. Added to this I am glad to report that the number of consumers has also grown. There are now 5463 ordinary and 6018 coin-meter consumers—making a total of 11,481, or an increase of 191. Hired stoves have increased from 9152 to 9516, an addition of 364. Residuals are, of course, always a very important factor. During the past half year the receipts from this source have exceeded by £1000 last year's returns. Most of this arises from the increased value of coke. Thus with the assistance of £500 transferred from the reserve fund the balance at the credit of the revenue account is enough, within a few pounds, to pay the dividend recommended.

The CHAIRMAN moved the adoption of the report.

Mr. C. F. BOTLEY, in seconding, passed some friendly criticisms on certain of the accounts; and, in referring to the undertaking generally, he said the business of the Company was splendid and he accounted himself fortunate to be an investor in it. Considering the very low price of gas, and the moderate increase made in the charge to consumers, the excellent results achieved were certainly very remarkable. The time would, however, come when fresh capital would be required, and this would entail a larger sum paid in dividend. It would be necessary, therefore, for the Directors to pursue a watchful policy, strengthening if possible the Company's financial position and trenching upon the reserves as slightly as possible.

The motion was carried, and the dividends recommended were declared—7⅜ per cent. per annum on the "A" stock, 5⅞ per cent. on the "B" stock, and 5 per cent. on the preference stock.

The retiring Directors and Auditor were re-elected. The latter, in returning thanks, paid a warm tribute to the staff, both at the office and at the works. He especially eulogized the devotion of Mr. Garrard, Mr. Jones, and Mr. Hammond, who were fortunate in being backed-up by an efficient and willing staff. The Chairman, in his response, said it might be a little consolation, perhaps, to the stockholders to know that at present they had 10,000 tons of coal in stock. When he told them that at one time during the year they were within a week of putting the town in darkness, they would understand what a relief it was that they had so large a quantity now on hand. In reply to a question, the Chairman said they consumed about 700 tons of coal a week; so that they had sufficient to last them for 15 or 16 weeks.

It was next resolved—"That the Directors be paid a remuneration for the year ensuing of £1200, free of income-tax."

In response to a vote of thanks passed to the Directors, officers, and workmen for the care with which they had conducted the affairs of the Company,

Mr. FRANK JONES (the Consulting Engineer) said he had heard a similar resolution submitted a great many times, not only there, but elsewhere; and, speaking rather as a looker-on, he could confidently say the compliment was well deserved. He would say nothing about the Directors, whom they knew so well, and on whom they relied so implicitly; but with regard to the other officials and the staff, he could honestly say they were entitled to all the grateful and appreciative things they could shower upon them. Night and morning he had visited the Company's offices and works; and, although his visits were irregular and casual, he never failed to find the officials and staffs

sedulously employed. He referred particularly to the labours of Mr. Garrard and Mr. Hammond, observing with regard to the latter that, though handicapped by shortage of men, their new Manager had proved himself fully equal to his responsibilities.

Mr. GARRARD, who also replied, read an extract from the Consulting Engineer's half-yearly report to the Directors: "Generally speaking, I think the Board are justified in being satisfied with the half-year's working, when one looks to the fact that the past half year has been probably by a long way the most difficult one for conducting the works in the history of the Company. Different kinds of coal (ten to be precise), changes of foremen, shortage of men, and difficulties of supplies generally have given Mr. Garrard and Mr. Hammond a most anxious and hard task. But I hope during the present half year, with the more normal supplies of materials and the very large stocks which the Company now hold of coal and oil, that the figures will show an improvement in the make of gas per ton, the leakage, and the amount of sulphate made." Mr. Garrard added that the co-partnership scheme had been well maintained. It had grown so vigorously that nearly every man in the Company's employ was now a co-partner, and sixty of them would become shareholders in a very few weeks—they having contributed sufficient to entitle them to be stockholders. The bonus granted to the workmen, supplementary to their wages, amounted to nearly £1100. The amount paid to the wives and children of workmen serving their country at the Front amounted to £125 a month. It not only meant useful help to wives and children, but created in the men and their families extraordinary feelings of affection and gratitude to the Directors and the Company generally, who took such deep interest in their welfare. There were in all about 70 men who had joined the Army and Navy.

A vote of thanks to the Chairman brought the meeting to a close.

## BOURNEMOUTH GAS AND WATER COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C., Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting, and the Directors' report and the statement of accounts were taken as read.

### A DIFFICULT AND ANXIOUS HALF YEAR.

The CHAIRMAN, in presenting the report and accounts for adoption, said he doubted whether, in the whole history of the Company, those concerned in its administration had ever had a more anxious period to go through than during the last six months. To get coal at all—to get it at he could hardly say a reasonable price, but at a price of any kind, and to get it safely to Bournemouth, had required all the energy and enterprise of their Acting-Manager (Mr. P. G. G. Moon), and all the assistance that the Board could give him during the six months. Here let him (the Chairman) say that, in giving, on the ground of the strength and condition in which the Directors felt sure the staff was in, their consent to the Company's General Manager (Major Harold W. Woodall) to go and serve his country, they had been in every way fully justified. In all respects, Mr. Moon had risen to the occasion; and he and those associated with him had been enabled to do good work during a very difficult and anxious half year.

### THE CAPITAL ACCOUNT AND NEW SANCTION.

A few words with reference to the accounts. On capital account, in June of last year, they had overspent by about £27,000; and now it would be seen that there was in hand something like £4000. The capital commitments were not in any sense of the word heavy. They consisted mainly in finishing a new holder, which was now almost completed. The debenture stock, amounting to £12,500, which they had authority to raise, would last, he hoped, for some little time. He should therefore explain that, in calling the extraordinary meeting at the close of the present one, at which the Directors were going to ask for additional capital powers, they were simply carrying on, he might almost say, the rule of the Company to be well ahead in these matters. In asking the proprietors to give their sanction to these additional powers, he might say that the Board did not propose to expend the money immediately, but they would call it up and spend it only as required, and with the greatest possible care. The Directors did not think this was a spending time. All the same, it was a precaution to be somewhat ahead in these matters, so that, if money was wanted, they would have authority to raise it. The Directors therefore desired powers to create, as required, capital stock to the amount of £25,000, with borrowing powers to the amount of £15,716.

### A GOOD TRADING HALF YEAR.

The revenue account (he thought he might say), as he had had to say half year by half year ever since he had occupied the chair, was of the most satisfactory character, in spite of all their troubles and difficulties. They had had an increase of 9¾ per cent. in the sale of gas, and an increase of £700 in the water revenue. On the other hand, the public lighting had gone down. Bournemouth was now almost pitch-dark after eight o'clock in the evening, which was a most unsatisfactory condition from the Company's point of view, whatever it might be from the national point of view. What they had temporarily lost in this way, they had to make up in other ways. They had their camps, their soldiers, their hospitals, and their convalescent homes in connection with the war; and, in these and other ways, the Company had reaped a business advantage during the past six months which had made up, or partly made up, for their troubles and difficulties on the other side. Residuals, of course, had fetched higher and better prices, and partly made up for the loss occasioned by the enormous price they had had to pay for coal. So far so good.

### THE PRICE OF GAS AND CO-PARTNERSHIP IN TROUBLES.

He could not speak very enthusiastically as to the future. They must anticipate, or be prepared to anticipate, difficulties. They could not keep for ever as sources of consumption the troops, hospitals, and convalescent homes; he trusted, at any rate, they would not have to do so. But the special advantages they had had during the past six months, they could not hope to maintain in the future. Then the increased price of coal had, as in the case of all, or nearly all, gas companies, necessitated an increase in the price of gas. All he could claim for the increase was that it was of the most moderate character of 4d.—an increase which, he thought, compared very favourably with that made by other companies. He hoped he could assure everybody concerned that the advance would be of the most temporary character. Directly the Board could see their way clear to get back to normal times, or anything like them, they would return to what he might call the normal price of gas. On the other hand, when troublous times came, an increase in the price of gas made everybody share in them—the proprietors were now suffering, the consumers were suffering, and the co-partners were suffering; and the special fund to which the Directors and officers had subscribed among themselves would also suffer. It was about the fairest way of proceeding, to ask all to do their share in paying for the additional cost that had come upon the Company. But, after all was said and done, the Board had a full statutory dividend to offer the proprietors; and, under the circumstances, he thought he might ask the proprietors to congratulate the Company, and everybody concerned, upon the results of the past half year's working.

### THE RESERVE INVESTMENTS.

Before leaving the accounts, he should like to say a few words about the reserve fund. It now amounted to £60,000, of which £40,000 was invested in securities the value of which had fallen somewhat. But the Company were not obliged to sell these securities; and he thought they could look forward to normal times, or at least he hoped they could, when such loss as had occurred would be wiped off, or largely wiped off, by gains. There were £12,000 in Government securities at 2½ per cent. The Directors proposed to be patriotic, and to do what everybody was doing, convert these securities into War Loan.

### THE MEN AND WAR WORK.

On more general matters, he need not detain the proprietors long, because, after all, the thing to do was the best they could in an emergency. The co-partnership was working most satisfactorily. He only the other day attended the annual meeting of the employee co-partners; and a more satisfactory meeting could not possibly have been held. The men were enthusiastic. There was an evident desire on their part to assist the Company to the full extent of their power in these anxious times, so that the concern could do well. Of course, the proprietors must bear in mind that labour unrest was very prevalent; and the temptations that the Government were offering now in the way of increased wages for special purposes was a very serious matter to deal with. But the men who were left to them had almost universally resisted the temptation. A large number of the men had left them to serve their country on land and sea; and some had fallen. All their employee co-partners considered they belonged to one family; and they had worked for, and had stood by, the Company loyally and firmly throughout all the temptation that had existed. But they were all anxious to do something for the country at the present time; and so, in connection with munitions work, the Directors had given the Acting General Manager almost *carte blanche* to do what he liked to assist the Government. He (the Chairman) was glad the Company had already obtained a contract for 3000 18 lb. shell cases; and that a special staff was at work every night upon their manufacture. This important war work had pleased the men; and he was sure he could say it would please the proprietors to know that not only were the Company able to do this, but they were also helping in the production of the raw material for high explosives. Thus they were justified in rejoicing that they were in the position to render material help in this time of national want and extremity.

### A SAFE COAL STOCK.

The stock of coal, the proprietors would not be surprised to hear after what he had already said, was most satisfactory. They congratulated their Acting-Manager in having got through and over a great many of, if not all, the troubles, in this respect; and it was now hoped they could see safety in their position. He would not put it stronger than that.

### AT THE FRONT.

The proprietors would be interested to hear, with regard to the war, that, acting in accordance with their wishes, the Board allowed all the members of their staff and men—starting with their General Manager (who was serving his country in India, and of whom they had splendid reports) downwards—who could be spared—perhaps even more than could be spared—to join His Majesty's Forces. Of the whole number, they had only lost one by death (and he thought this was really a source for congratulation), and thirteen had been wounded. The proprietors would be pleased to hear that the Company and the men had been represented in nearly every important action, both on sea and land, since the beginning of the war.

### THE VACANCY IN THE AUDITORSHIP.

At the last half-yearly meeting, Mr. Benwell was re-elected an Auditor. Unfortunately, they had now lost him. The Directors expressed the greatest regret at his loss; for he did good active service for the Company for 24 years. The election of an Auditor to fill the vacancy was entirely in the hands of the proprietors. But the Board suggested (it was merely a suggestion on their part) that the most convenient plan—it was one that had been followed in connection with other companies—to save all the paraphernalia of anything like a contested election, would be to elect a small Committee of three or four proprietors to consider the appointment. They had already the names of three candidates; and if these gentlemen were willing to submit their claims to the Committee of Proprietors, there could be a nominal adjournment of the present meeting for a fortnight, when the gentleman recommended by the Committee would be appointed. In due course he should propose a resolution on the subject.

### HOPEFULNESS IN STRENUOUS TIMES.

He did not think he need say more. All they could do now was to be hopeful. These were strenuous and terrible times. They could only do their best, as he thought the Directors could claim they had done during the past six months, and had presented the proprietors with, on the whole, a most satisfactory state of affairs. May it continue! He could promise, so far as the Board were concerned, and on behalf (he was sure) of the whole staff, that they would all continue to work on

steadily and carefully to maintain the same position as far as possible that the Company had always held.

Sir CORBET WOODALL seconded the motion, which was carried.

THE DIVIDENDS.

Moved by the CHAIRMAN, and seconded by Sir CHARLES J. JESSEL, Bart., the following dividends were declared, all less income-tax. At the rate of 6 per cent. per annum on the preference shares, 7 per cent. on the "B" ordinary shares, and 15 per cent. on the original shares.

THE AUDITORSHIP.

The CHAIRMAN then proposed for election on the Committee, to determine the successor to the late Mr. J. C. Benwell as Auditor, Mr. Arthur Woods, of Messrs. Arthur Woods and Co. (Mr. Woods and his firm had been connected with the Company practically from the beginning), Mr. William A. Surridge, the Chairman of the Herne Bay Gas and Electricity Company, Limited, and Mr. H. Milner Willis, who had been a shareholder and connected with the Company for many years. It was proposed that these gentlemen should consider the several candidates' claims, and then report, at the adjourned meeting to be held that day fortnight, who they recommended for election. Their nominee would then be formally put before the adjourned meeting; and the Committee's selection would no doubt be ratified by the proprietors.

Mr. WILLIAM CASH, F.C.A., seconded the motion. He remarked that this procedure was adopted, or suggested, by the Board, as one which would save both the candidates and the proprietors a good deal of discussion. The gentlemen named to serve on the Committee were all representative proprietors, and he thought the matter might be safely left in their hands. It was one in which the Board did not wish to take any part whatever.

The motion was unanimously carried.

The CHAIRMAN announced that there were at present three candidates: Mr. Glen, who was a chartered accountant, and son of a former Director; Mr. Sloman, partner of the late Mr. Benwell; and Mr. Jackson, of the firm of Messrs. Jackson, Pixley, and Co. He added that the remuneration of the Auditor was not a matter that would come up for consideration on this occasion. But the new Auditor would, until otherwise determined, have the same remuneration as Mr. Benwell.

Mr. E. L. BURTON said he did not particularly care to enter into a competition for the auditorship; but he would put down his name and so make the number of candidates four.

VOTES OF THANKS.

The CHAIRMAN proposed that a very hearty vote of thanks be given to their Acting-Manager, their Secretary, the staffs, and the workmen. He said they all deserved these thanks. He had spoken of Mr. Moon, who had been most successful, through the energy and determination with which he had carried on the work. With this his (the Chairman's) colleagues all agreed; but Mr. Moon would tell them that he could not have accomplished what he had done had he not been assisted in every way by his staff. In Major Woodall's absence, he ought to say that he had left behind him a staff in a highly efficient condition. They could not forget their General Manager in his absence; and he in India was thinking of them that day. Regarding Mr. Plumb, as always he had done his work well, and never better than in the past difficult half year.

Mr. BURTON seconded the motion; and it was heartily carried.

Mr. PLUMB briefly acknowledged the vote.

Mr. MOON also thanked the Chairman, Directors, and proprietors on behalf of the Bournemouth staff and workmen. He observed that the Chairman and Directors had helped them tremendously. The Chairman had impressed the fact which must, of course, have been apparent, that any good work that had accrued had come entirely from the most loyal and cordial co-operation of every member of the staff and every employee. Their loyalty had been unswerving, and their energy splendid. The loyalty of the workmen was something that was very material, because there was, within five miles of the works, a big Government factory. The fact that the men in the face of this remained with the Company was considerable testimony to their loyalty. They had, as the Chairman had indicated, lost a few men who had not resisted the temptation. But he (Mr. Moon) was bound to admit that in these cases the temptation had not been one so much of money as a desire to feel that they were personally asscciated with something that was essentially war work. This was why he felt that the fact that they were now making shell cases, and were extracting toluol for ultimately filling these cases, had had a wonderful steadying effect (by producing a gratifying sense of helping the country) upon the whole staff. He should not like to reply to the vote of thanks without mentioning the name of their respected chief, Major Woodall, because the Bournemouth staff was one that he had chosen and trained; and if they were able to do the work acceptably in his absence, it was because he had so trained them, and left them to walk in well-defined paths, and according to a well-constructed policy. They had occasionally very happy letters from their chief, whose heart was with them though he was chained to India at the present time. One other matter. At the last meeting, it was suggested by the proprietors that it would be a happy thing to send a circular letter, accompanied by a small present —a postal order of 5s. was suggested—to their men who were away with the forces. These letters and orders were sent out as from the proprietors to some 160 to 180 of their men who were serving in various parts of the world; and in almost every case, interesting letters had been sent home by the recipients in which were expressed their cordial thanks.

Mr. SLOMAN asked to be allowed to thank the Chairman for his kind references to his late partner, Mr. Benwell.

### Extraordinary Meeting.

An Extraordinary General Meeting was then held, for the purpose of considering resolutions authorizing the Directors to raise additional capital to the amount of £25,000, and debenture stock to the amount of £15,716.

On the motion of the CHAIRMAN, seconded by Mr. CASH, the necessary resolutions were passed.

The CHAIRMAN's acknowledgment concluded the proceedings.

## GENEVA MUNICIPAL GAS SUPPLY.

### Last Year's Statistics.

The accounts for the past year of the undertakings under the control of the Municipality of Geneva, which have lately been issued, furnish the following particulars in regard to the supply of gas. We are indebted for them to a recent number of the "Journal des Usines à Gaz."

The total consumption in 1914 was 13,980,770 cubic metres (about 493⅓ million cubic feet), which was 3·574 per cent. less than in the preceding year. The average consumption per day in the latter year was 39,723 cubic metres (1·40 million cubic feet), compared with 38,308 cubic metres (1·35 million cubic feet) in 1914. In the last five months of the two years the consumption (in cubic metres) was as follows:

| | 1913. | | 1914. |
|---|---|---|---|
| August | 1,186,170 | .. | 1,038,900 |
| September | 1,269,600 | .. | 1,123,320 |
| October | 1,330,200 | .. | 1,159,990 |
| November | 1,272,440 | .. | 1,110,010 |
| December | 1,344,810 | .. | 1,172,820 |
| Total | 6,403,220 | .. | 5,605,040 |

The minimum daily consumption last year was in August (29,700 cubic metres); whereas in 1913 it was in March (29,360 cubic metres).

The quantity of coal gas manufactured was 11,771,100 cubic metres (415⅓ million cubic feet), and of carburetted water gas 2,210,860 cubic metres (78 million cubic feet); the proportion of the latter gas in the mixture being 15 81 per cent. In its production, 1,379,430 kilos. of coke and 684,351 kilos. of oil were used; being an average of 0 624 kilo. of coke and 0·31 kilo. of oil (equal to 1·37 lbs. and 0·68 lb. respectively) per cubic metre (35·3 cubic feet).

The average price of coal delivered on the works last year was 37 frs. 2 c. per metric ton, against 33 frs. 45 c. in 1913—an increase of 3 frs. 57 c. In stating this average price, account is taken of the large quantity of coal in store at the declaration of war. The average price of coal purchased in the first five months of the war and since has naturally been much higher than the 37 frs. 2 c. already mentioned. Before the war the coal came partly from the mines of Montrambert, Rochela-Molière, Blanzy, and Aubin, in the North of France; but at the outbreak of hostilities the deliveries from these mines ceased. The works were then carried on with Thornley coal from England, and subsequently with supplies from the mines of the Ruhr and the Saar.

The gas produced last year was disposed of as follows:—

| | Per Cent. |
|---|---|
| Consumed by meter | 80·91 |
| Lighting stairs and courtyards | 2·30 |
| Public lighting | 6·74 |
| Works and offices | 1·18 |
| Unaccounted for | 8·87 |

The population of Geneva and the neighbouring communes, according to the last census, is 127,969; and the gas consumption works out to 109·2 cubic metres (3855 cubic feet) per inhabitant. The number of consumers is 34,286, or one to every 3·7 of the population. The number of meters in use is 35,066, and the consumption by this means amounts to about 329 cubic metres (11,600 cubic feet) per consumer and 88·4 cubic metres (3100 cubic feet) per inhabitant. In 1913 the latter figure was 91·7 cubic metres (3237 cubic feet). Though there was only a slight increase in the cost of coal in Geneva, compared with other places, in the last five months of the year, the average price of gas sold was higher by 2 c. per cubic metre (5½d. per 1000 cubic feet).

The old gas-works have been given up, and new ones erected at Châtelaine. Progress with them was impeded by the outbreak of the war; but they were brought into use in November, and appear to answer all expectations.

## Installation of Gas in American Public Buildings.

The Supervising Architect of the United States Treasury has recently decided on the conditional piping of Government buildings for gas. The conditions are set forth in the following intimation: "As the result of a recent investigation, it has now been decided that, in the future, Federal buildings in large cities like New York, Chicago, Philadelphia, &c., will not be piped for gas unless the data show that the electric service is liable to interruption; and that buildings in smaller cities, where the electric service is liable to interruption, or where the cost of the current for lighting is more than 4 c. per K.W.H., will be piped for gas throughout, and combination gas and electric fixtures and gas brackets will be installed as part of the original lighting installation at such points as the exigencies of the service demand." In this connection, says the "Gas Record," it is interesting to note that the two most conspicuous buildings in the world—the Woolworth building in New York and the L. C. Smith building in Seattle (Washington)—are both equipped with full gas-piping throughout. The Woolworth building—the highest building in the world, 57 storeys high, with a floor area of 27 acres, and towering 750 feet in the air—has 43 miles, or 227,040 feet, of wrought-iron pipe in it. The L. C. Smith building—the highest building in the world outside of New York, with 42 storeys—has 17 miles, or 89,760 feet, of wrought-iron pipe in it. The gas companies in the larger cities have been for years consistently campaigning for the piping of all buildings; and their activities have been rewarded with practically complete success.

Damage to the extent of £2000 was done by a fire on Monday last at the works of Messrs. Sir William Arrol and Co., Limited, of Preston Street, Glasgow. A serious outbreak of fire took place at the Addiewell works of Young's Patent Paraffin Light and Mineral Oil Company, Limited, on Wednesday. The material damage was considerable; but no reliable estimate of it could be formed. It will take several weeks to replace the material destroyed; and it is said that, in all probability, the works will be idle for a time.

## CHORLEY CORPORATION GAS DEPARTMENT.

### Reduced Lighting, War Badges, and Coal Contracts.

Mr. J. W. Allin, the Engineer and Manager of the Chorley Corporation Gas-Works, presented a special report to the Town Council on Friday regarding economy in the public lighting of streets during the coming winter, showing how a saving of £380 could be effected under conditions which he described as considerably better than when working under the severe lighting restrictions arising out of the Defence of the Realm Act. He added that he thought the public would be prepared to accept with good grace any little inconvenience the reduced lighting might cause, seeing that the object was one of economy and saving, as had been suggested by the Local Government Board. He also proposed to supply to the men employed at the gas-works a private war badge, as mentioned at a previous meeting.

Mr. E. W. Heald (the Chairman of the Gas Committee), in moving the adoption of the minutes [including the foregoing], said a communication had now been received from the War Office stating that they proposed supplying war badges for men employed at the gas-works. There would be certain distinctions; but in the majority of cases the men would have the official badge. In the circumstances, he wondered whether it would be wise to let this portion of the minutes relating to war badges remain. Mr. Turner moved, as an amendment, that the reference be deleted. Mr. Sandham pointed out that it would be better to leave the minute as it originally stood, so that in the event of the War Office not supplying the badges the Gas Engineer would have power to deal with the matter. This was agreed to.

The minutes also showed that formal notice had been given to certain collieries under the Price of Coal (Limitation) Act, 1915, for an abatement, if necessary, in their contract price, so far as it exceeded the standard amount specified in the Act. Mr. Sandham said he hoped the Gas Committee would bear in mind, if they made a substantial income from this particular source, the increase in the price of gas that was recently made [see "JOURNAL" for June 29 last, p. 774], and to do all that lay within their power to reduce the price.

## CARDIFF PUBLIC LIGHTING ECONOMIES.

The Public Lighting Committee of the Cardiff Corporation met last Tuesday, and agreed to the principle of practically reducing the street-lamp service in gas and electricity by one-half, as from the commencement of September.

The CITY TREASURER (Mr. J. Allcock) reported, in conjunction with the City Engineer (Mr. W. Harpur), that, owing to the increase in the price of gas from June 30 last, the item of £3950 in the estimates for gas must be increased by £60, to £4550. By discontinuing the lighting of half the street gas-lamps during the second half of the year, however, a saving of £1187 would be effected, reducing the figure to £3363. It was also estimated that a reduction of part of £975 could be effected by stopping the provision of automatic lighting and extinguishing apparatus, by the reduced work of cleaning lamps, &c.; so that the total saving in street lighting by gas would approximate £1562. This figure is subject to several adjustments between the Corporation and the Gas Company.

The TOWN CLERK (Mr. J. L. Wheatley) stated that, under the contract with the Gas Company, a week's notice must be given of any proposed reduction in the number of street-lamps. It was accordingly decided to give the necessary notice in order that the reduced service should come into operation during the first week in September.

According to the original intention, the reduced service would come into force on Oct. 1; but the Committee adopted Alderman Thomas's view, that the new order of things should commence before the long nights came on, so that the public might be better able to accustom themselves to the change. A schedule of the lamps to be discontinued would be agreed between the Committee and the Gas Company.

Mr. ARTHUR ELLIS, with regard to the public electric lamps, recommended that all those put out at midnight under the present system should remain unlit throughout the next half year, and that other reductions should also be made in special streets. Calculated on an annual basis, the saving resulting from this discontinuance would amount to £2264; so that, with the gas-lighting reduction, the total economies, subject to adjustments, would approximate £3826.

It was decided to adopt Mr. Ellis's suggestions as from Sept. 1.

Owing to the advances in the price of coal and other outgoings, it was decided to add 12½ per cent. to the expenditure side of the accounts of the Electric Lighting Department, and to give notice to all customers, other than those under special contract, of an increase in the price of electric light commencing in October.

According to the "Sanitary Record," during the first four months of this year the Milan works of the Italian Welsbach Company sent out 2,002,000 incandescent mantles, as against 900,000 in the same four months of 1914. The firm claim to have captured the whole market of Egypt and British India.

Mr. Alister R. Mackenzie, Assoc.M.Inst.C.E., of Vancouver, British Columbia, the eldest son of Mr. and Mrs. Mackenzie, of Erradale, Inverness, has just received a very important appointment from the Government of British Columbia. Some time ago it was determined to appoint a Royal Commission to investigate the irrigation troubles of the Province; and it was decided that the Commission should consist of one man only, an expert in water and hydraulic engineering. Last week this important appointment was offered to Mr. Mackenzie, who has accepted it, and embarks on his investigations forthwith. Mr. Mackenzie, after some years' experience in South Africa, proceeded to Vancouver, where he built up a large practice as a consulting civil and hydraulic engineer. He is also an expert in matters relating to water power and supply; and the Commission with which he has now been charged is a tribute to the high position which he has won for himself in the country of his adoption. Mr. Mackenzie's investigations will probably occupy him for seven or eight months, and will entail a thorough survey of the water problems of British Columbia.

## GAS, WATER, AND ELECTRICITY AT BATLEY.

The abstract of accounts of the Batley Corporation for the year ended March 31 has recently been issued in a volume of more than 200 pages. Some interesting details prepared by the Borough Treasurer (Mr. R. G. Rutter) include tables showing the financial results of the working of the municipal undertakings during a period of ten years, and a useful summary of local statistics. The area of the borough is 3227 acres; the estimated population, 37,060; the rateable value, £181,500; and the product of a penny rate, about £650. In round figures, the municipal debt is £634,000, of which £455,000 is productive and £179,000 unproductive. The debt per head of the population exceeds £17; but more than £12 per head is invested in productive concerns. On the other side, there is a surplus of assets over liabilities of £12 per head; so that the net indebtedness is less than £5 for each resident.

From the gas undertaking £4650 was last year transferred in relief of rates; but the net profit realized was only £3524—leaving a deficit of £1126. Therefore the credit balance of £1373 with which the year was begun was reduced to £247. The gas-works, however, have been consistently remunerative; the net profits in each of the last ten years having been respectively—£4262, £4202, £4428, £2543, £3413, £6131, £5181, £5798, £4587, and £3524.

The year's accounts of the electricity works opened with a credit balance of £138. A net profit of £634 was made, giving a total available sum of £772, of which £714 was appropriated to liquidate the outlay on a new switchboard. Thus the amount remaining in hand was only £58. In five of the last ten years this department has been worked to financial advantage; the figures from 1905-6 to 1914-15 being: Loss £61, profit £494, profit £121, loss £307, profit £170, loss £127, loss £37, profit £1, loss £116, profit £634.

On the water-works there was a loss of £206; and as the previous year's deficit was £314, there is now a debit balance of £520. This department of municipal enterprise has not been attended with encouraging results. Taking the last ten years, the figures are: 1905-6, profit £1232; 1906-7, loss £2063; 1907-8, loss £1181; 1908-9, loss £2609; 1909-10, loss £2383; 1910-11, profit £962; 1911-12, loss £1136; 1912-13, profit £273; 1913-14, loss £530; 1914-15, loss £206.

The general balance-sheet shows that, compared with the previous year, the surplus of assets over liabilities increased by £23,596—from £428,269 to £451,865. The authorized borrowing powers of the Corporation amount to £1,209,047; and the actual borrowings have been £1,068,721—leaving a margin of £140,326. Nearly half of the borrowed money has been repaid; the total of the outstanding loans being £666,354. From loans and revenue accounts there has been a capital expenditure of £1,084,462—including £372,425 on the water-works, £194,739 on the gas-works, and £55,721 on the electricity undertaking.

From 1905-6 to 1908-9 inclusive the rates were 7s. 6d. in the pound. In 1909-10 they rose to 8s. 6d., in 1910-11 and 1911-12 they were 9s. In 1912-13 they were 9s. 7d., in 1913-14 they were 9s. 10d., and now they are 10s. In the same period the gas charges have been increased from 2s. 1d. per 1000 cubic feet to 2s. 7d., and the charges for water through meters from 6d. to 8d. and 9d. per 1000 gallons.

## SUGGESTED SUSPENSION OF SINKING FUNDS.

### Reply by the Secretary for Scotland.

On more than one occasion, there has been reference in the pages of the "JOURNAL" to suggestions made that the Committee of the Scottish Convention of Royal Burghs should approach the Scottish Office to secure a suspension during the war of the sinking-fund provisions relating to gas undertakings. Eventually, the following suggestions were placed before the Secretary for Scotland by the Committee: (1) That in special cases the postponement of capital repayments by local authorities for reasons specially due to the war, and on good cause shown, might be favourably considered by the Scottish Office. (2) That the depreciation fund provisions of the various Acts of Parliament under which gas undertakings are administered should be suspended for the duration of the war, and until the first term of Whit Sunday occurring not earlier than one year after its close.

In his reply, the Secretary for Scotland says that he is fully sensible of the peculiar difficulties attending the financial administration of local authorities at the present time—difficulties which he knows are especially felt in relation to gas undertakings, in view of the enhanced prices which have had to be paid for coal supplies in recent years. Notwithstanding this, it appears to him that it would be most regrettable, even in a single case, to deviate from the sound rule that the current obligations of each year must be provided for and discharged as they arise, and not passed on to the ratepayer or consumer of subsequent years—who will have his own liabilities to bear, under circumstances of possibly greater financial stress than exist at this date. The present proposal of the Convention seems to proceed on the assumption that in the years which follow the war easier financial conditions will prevail. There may be some ground for expecting a certain measure of relief in the case of gas and other undertakings which are largely dependent on coal supplies; but (to select only one matter of importance) the fact that the war has necessitated borrowing on an unprecedented scale, which will mean enormously increased National Debt charges for many years to come, appears to preclude any general assumption of the nature indicated. He trusts, in all the circumstances, that the Convention will use their influence, in the general interest of local authorities, as well as the national interest, to secure that all statutory obligations in relation to sinking funds and depreciation funds—the postponement of which would merely mean heavier burdens on future years—shall be fully met as they arise.

At the half-yearly general meeting of the British Gaslight Company, Limited, shortly to be held, the Directors propose to recommend, subject to audit, a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, for the half year ended June 30, both less income-tax, and payable in October.

## WATER-WORKS EXTENSIONS AT HULL.

### Stopped by the Treasury.

Last Thursday the Hull Corporation Water Committee held a special meeting to consider a letter received from the Local Government Board advising the Corporation to stop certain extensions of the water-works involving the expenditure of many thousands of pounds.

The letter stated that they had had under consideration the report of their Inspector (Mr. Fawcett), and the amounts sanctioned for the construction of certain water-works. These make a total of about £56,000. As regards the Dunswell works, amounting to £14,000, the Board say that these should be stopped at once, "except as to any lining required to make the well usuable by means of temporary pumping plant." The existing sources, it is added, can, with care, be made to suffice for some time to come.

Alderman T. Hall asked whether it was in the public interest to stop the works. He thought it might be possible to show that, in the course suggested, the public interest would be sacrificed.

The Chairman (Mr. Gaskell) replied that the Inspector went very fully into the situation, and was satisfied that Hull had an abundance of water to meet present demands. The matter had been reported to the Treasury; and the Treasury ordered them to stop the work.

Alderman Hall reminded the Committee that at the Local Government Board inquiry, when permission was sought to borrow the money, it was argued that, as Hull was getting very short of water, they were absolutely compelled to commit the Corporation to a very large capital outlay. The only difference in the position then and now was the difference in the depth of water in the wells at Cottingham and Springhead. When the application was made they had had a dry season; but since then they had had a wet season, and the water in the wells had risen. His own view was that they got into a panic when the application was made—they started in a panic, and they were, apparently, going to stop in a panic.

The Chairman said they had already a bore which had been opened out, and which could be available at any moment to get anything from half-a-million to a million gallons a day.

The matter was referred to the Chairman, the Deputy-Chairman, the Town Clerk, and the Water Engineer, with full power to order the contractors to stop the works, to take any further steps that might be advisable, and to report to the full Committee.

The action of the Treasury will not, it is said, affect the work in progress for taking Hull water to Withernsea. This scheme is practically completed.

## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 30.

Growing interest is being displayed in pitch for export for the coming season. The value remains without change at 26s. per ton net, in bulk, at makers' works. Other values are: Creosote, 4¼d. per gallon, in bulk; 95-160 solvent naphtha, 2s. 1d. per gallon, naked; anthracene, 48-50 per cent., 2½d. per unit, casks free—all at makers' works, net cash. Crude and crystal carbolic acid, toluol, and benzol, are, of course, controlled by the Government.

Twenty-five per cent. sulphate of ammonia is steady at £14 8s. 9d. per ton net, in buyers' bags, at makers' works.

### Tar Products in the Provinces.

*Aug.* 30.

The markets for tar products have remained fairly steady during the last week. Very little business is reported in pitch, and contracts are almost at a standstill, owing to neither buyers nor sellers wishing to take the risk of freights. Solvent and heavy naphthas are in fair demand. Sales of creosote are still reported at reasonable prices.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to 3 1/16d. Heavy oils, in bulk, 3 7/8d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

### Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Aug.* 28.

In the early part of the week the market receded a little more, but towards the close there has been a slight improvement in the tone, and the loss sustained in values has been recovered. Having obtained fresh export licences, dealers have shown more disposition to make further purchases, but new foreign orders have not been much in evidence. To-day's quotations are £14 10s. per ton f.o.b. Hull, £14 11s. 3d. f.o.b. Liverpool, and £14 12s. 6d. f.o.b. Leith. In the forward position, the volume of business has not been large; but it has transpired that first-hand transactions have taken place f.o.b. good ports at £14 15s. per ton for October-December delivery, and at £14 17s. 6d. for January-March.

### Nitrate of Soda.

Owing to scarcity on spot, prices have advanced rapidly this week, and holders now require 13s. 9d. per cwt. for ordinary, and 14s. for refined quality.

### Sulphate of Ammonia.

From another source it is stated that the market for this article has been very quiet during the past week, and sales have been made at lower prices. Outside London, makes are quoted at £13 17s. 6d. to £14; Hull, £14 7s. 6d.; Liverpool, £14 10s. to £14 12s. 6d.; Leith, £14 15s.; Middlesbrough, £14 7s. 6d. to £14 10s.

## COAL TRADE REPORT.

### Northern Coal Trade.

The coal trade is quiet, through the scarcity of ready steamers and the difficulty in getting licences for export coal. There is a good supply of fuel relatively, and buyers have been able to take advantage of the position in some cases. In the steam coal trade, best Northumbrians are from 19s. per ton f.o.b. for early shipment; second-class steams are dull at 16s. 9d. to 17s. per ton; while steam smalls are plentiful at 13s. 3d. to 14s. 6d. per ton, according to the quality. Work at the collieries seems to be steadier, except where difficulties in shipment intervene. In the gas coal trade, the home demand is increasing; but the foreign shipments are less, from the same causes that affect the steam coal trade. There is therefore ease in the quotations for this class also. Best Durham gas coals are 19s. to 19s. 6d. per ton f.o.b.; and second-class qualities are 17s. per ton. "Wear Specials" are also lower; but they may be said to be fairly steady at 21s. per ton f.o.b. Freights, however, are higher, and gas coal, Tyne to London, may be 7s. 9d. to 8s. per ton; but the rates are irregular, depending on the arrivals at the coal ports. A contract for some 20,000 tons of best Durham gas coals, for shipment over the next three months, is said to have been entered into at 20s. per ton f.o.b. But there is not much now doing in forward contracts, as buyers and sellers have varying views as to the prices forward. Gas coke appears to be stiffer in price; the supplies being still small to what is usual at this season. Good gas coke is quoted from 28s. to 29s. per ton f.o.b. on the Tyne.

**Gas Explosion at Bradford.**—Last week a gas explosion took place in Manningham, Bradford, due to one of the gas-mains having been pierced by some men engaged in laying a drain. The house concerned had been untenanted for a week, and when the occupiers returned they found it full of gas. A report of the matter was sent to the Town Hall; and meanwhile the explosion was caused by a neighbour, who entered the basement with a lighted taper, in order to turn off the gas.

**Fleetwood Gas Company.**—At the half-yearly meeting of the Company, a dividend of 5½ per cent. per annum was declared, being ½ per cent. below that of last year. The Vice-Chairman (Mr. T. Popple, J.P., of Heywood) said the higher cost of coal necessitated an increased charge for gas. Though this would ultimately mean a diminution of dividend, the Board felt it was the best policy in the interests of the Company to take the step at once, and make a reduction for the first half year, as well as applying the principle to the succeeding year.

**Fatality at the South Metropolitan Gas-Works.**—The Coroner's Jury who inquired into the death of Edward Wainer, a labourer at the Old Kent Road Gas-Works, in returning a verdict of "Accidental death," expressed the opinion that the place where the accident occurred should have been better protected. It was stated that he was assisting in some repairs in a retort-house, when he fell from the end of the staging down a hole. Some of the plates at the end of the staging had been removed to permit of the work being carried out. There was plenty of room for him to work without going to the end of the staging. The hole was guarded by trestles and a pole; but the spot where he fell was not. The staging was well lighted.

**Morpeth Gas Company.**—The annual report and balance-sheet of the Company for the year ended June states that the gross profits amounted to £1970, which, with the sum carried forward from last year, leaves £2249 available. The Directors recommend dividends making 5 per cent. for the year on the preference shares, and 5¾ per cent. on the ordinary shares. The output of gas exceeded by a million cubic feet the record of last year. The continuance of the war necessitated restrictions in the lighting of business premises; and the suspension of public lighting naturally gave the Directors concern. But they trust that economy, together with the strong financial position of the Company, will enable them to tide over these difficult times without any diminution in the customary dividends. The Company have been called upon to provide another gasholder to meet the requirements of the town and district. This has necessitated the calling-up of the final 5s. per share on the new preference shares.

**Price of Gas at Saffron Walden.**—A lengthy discussion took place at a meeting of the Saffron Walden Town Council last week on the report of the Gas Committee, which stated that they had resolved to increase the price of gas from July 1 to 3s. 2d. per 1000 cubic feet. Mr. Miller moved an amendment to the effect that the price should be raised to 2s. 11d. He could not understand why the undertaking should charge consumers £1266 extra when the additional cost to the undertaking would only amount to £820. Last year the increase of gas sent out was 3,000,000 cubic feet; and the increase at present this year was somewhere about 13 per cent. If they put it at 10 per cent. on the rate of 2s. 9d., it worked out at £430, which would go a considerable way towards the £500 which the undertaking would not receive for public lighting. It was decided to refer the matter back to the Committee, to consider whether the price should be 2s. 11d., instead of 3s. 2d., as from Oct. 1, in view of the fact that some of the slot-meters had already been altered to the higher figure.

## Mansfield Gas Undertaking.

It was intimated at the last meeting of the Mansfield Town Council that the yearly report which was in course of preparation regarding the gas undertaking was not yet ready. Mr. T. Smith (the Chairman of the Committee) stated that there was an inquiry in progress; and the report would be of a full and detailed character when presented. He hoped it would be shortly in the hands of members of the Council. The Committee had decided to increase the price of coke to 15s. per ton; this being 1s. 8d. a ton more than a year ago. But he added that this had not been brought about by any circumstances at the gas-works; it being entirely due to circumstances over which they had no control. They looked like losing £1000 on tar; and some steps would have to be taken to recoup themselves. Alderman Taylor proposed an amendment to the Gas Committee's report—"That the Town Clerk be instructed to communicate with the contractors supplying coal to the Gas Department, drawing their attention to the Price of Coal (Limitation) Act, 1915, and asking them if they were prepared to make any abatement in price." The amendment was adopted.

**Madrid Gas Supply.**—The turnover of the Compañia Madrileña del Gas, of Madrid, for 1914, was 7,391,711 pesetas (£295,668), against 7,355,946 pesetas (£294,237) in 1913; the net profits amounting to 496,928 pesetas (£19,877), compared with 627,727 pesetas (£25,109) the preceding year.

**Windsor Royal Gas Company.**—In view of the half-yearly meeting called for the 22nd prox., the Directors have issued their report on their proceedings during the period January to June last. They state that the sale of gas showed a good increase over the corresponding half of 1914—partly to be accounted for by the large number of military billeted in the town. They add that, although many companies have been compelled to increase the price of gas, it is gratifying to the Directors to feel that for the present there is no occasion for the Windsor Company to do so. Their financial condition "indicates its continued prosperity," and the Directors propose that the statutory dividends be paid on all shares.

**Harrow and Stanmore Gas Company.**—This Company hold their half-yearly meeting next Monday. The report of the Directors for the half year to June 30 mentions that, throughout the past six months, coal and oil were obtained under favourable contracts made last year, and the price realized for coke was satisfactory. Owing to the "enormously increased prices" the Company will during the next twelve months have to pay for coal and all other materials required for the manufacture and distribution of gas, as well as the additional charges for labour, the Directors considered it advisable to increase the price of gas 2d. per 1000 cubic feet from Ladyday last. The balance standing to the credit of the profit and loss account is £12,090; and the Directors recommend dividends at the rate of 5¼ per cent. per annum on the ordinary stock, and 5 per cent. per annum on the preference stock (both less income-tax), leaving £5318 to be carried forward.

## War Bonus Question at Oldham.

The annual holidays of Oldham workpeople—known in Lancashire as "Oldham Wakes"—commenced last week-end, and will continue until next Saturday. The question of war bonus was, by agreement between the Gas-Workers' Union and the Municipal Employees' Association, deferred until after the vacation. The Municipal Employees' Association representatives now express themselves willing to accept the 2s. per week proferred advance. On the other hand, however, Mr. J. R. Clynes, M.P. (the General Secretary of the Gas-Workers' Union), has expressed his willingness to accept 3s. advance. The position, therefore, is that the former body offer to settle on the basis of 2s. advance for each workman in receipt of less than 40s. per week; but the Gas-Workers' Union men still press their claim for an all-round advance of 3s. Another conference of Union representatives and the Special Committee of the Corporation has been asked for; and if this is refused, the men are to ballot on the question of a strike. It is suggested by Mr. Clynes that the conference should consist of six representatives of the Union, with an equal number of the Corporation; the view of the Union being that by means of such a conference terms of settlement might be discovered which both sides could accept. Mr. Clynes pointed out that the offer of 2s. per week advance was not accepted by the men, as it extended no advance to those receiving 30s. or more per week. His argument was that men who received 30s. or more were in most cases those whose wages were higher than others, not for ordinary service, but because of the exceptional arduousness of their work, and the special necessities which required them to work on varying shifts at all hours, and to work also on Saturdays and Sundays.

**A Gas Suicide Case.**—Last Wednesday, at Hackney, there was a Coroner's inquiry relative to the death of a woman who dressed herself ready for burial before fixing a rubber tube in her mouth and turning on the gas tap to which it was attached. It was thought she had been fretting at the absence of her husband at Netley; and the Jury returned a verdict of "Suicide while of unsound mind."

**Position of the North Warwickshire Water Company.**—According to the "Birmingham Daily Post," public notice has been given that a petition has been presented to the Court, *re* the North Warwickshire Water Company, by the Mayor, aldermen, and citizens of Coventry, and will be heard in October. The Company obtained its first Act of Parliament nearly twenty years ago, and a second Act in 1900. Powers were given for supplying water in a number of villages; and several of them—including Foleshill, Meriden, Hampton-in-Arden, and Knowle—get water from the Company, whose works are at Keresley. When the City of Coventry was extended in 1899, the Corporation took over the Company's powers in the parishes affected by the extension, paying compensation for the acquisition. In later years, for a time, they supplied water in bulk to the Corporation, while recently the urban body has sold water to the Company.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See "Journal" for May 25 and June 1 & 8 (pp. 471, 525, & 596).

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## Chichester Gas Company.

It was reported at the half-yearly meeting of the Company that the balance standing to the credit of the profit and loss account, net revenue (after providing for the interest on the debenture stock, temporary loans, &c.), amounted to £1846, out of which the Directors recommended the declaration of a dividend for the six months to June 30 at the rate of 7 per cent. per annum upon the "A" capital stock, and £4 18s. per cent. per annum on the "B" and "C" capital stocks—all less income-tax. The figures in the accounts had been adversely affected by the restriction of lighting imposed by the military authorities. The Chairman (Mr. W. A. Walker) pointed out that the sales of gas had shrunk to the extent of 9 per cent.; while with regard to the chief residual products, for which they had entered into the usual annual contracts prior to the outbreak of war, they been deprived of the better prices obtainable, which were set up by the war conditions, so that they had been doubly hit. In common with almost every other company in the kingdom, the charge for gas had demanded careful consideration; and as from Oct. 1 last, the price was advanced 4d. per 1000 cubic feet. Whether or not this increase would suffice, would be a matter for the future to determine. The number of consumers had increased during the half year; but the average consumption per meter had decreased. The unaccounted-for gas had been reduced until it had reached the low figure of a fraction over 3 per cent. Five of the Company's employees were serving their King and country; and their places would be open for them at the end of the war. They were also allowing a war bonus to the workmen. The Manager (Mr. T. N. Ritson), replying to a vote of thanks, said the Company had a most loyal staff, and everything worked smoothly.

**South Hants Water Company.**—The half-yearly meeting of the Company was held on the 11th inst., at Southampton, with Captain A. J. Corse-Scott, J.P., in the chair. The rent roll had been increased in the six months to June by the connection of 246 houses, representing a rental of £206. There was a credit balance of £12,802 to be disposed of. The Company had been called upon to supply about 500,000 gallons of water a day for military purposes and hospitals; and as it was found that there was likely to be a considerable strain upon the resources of the Company through various camps being formed within the Company's district, it was decided to increase the carrying capacity of the Company's mains—a work that was nearly completed. Mr. A. W. Oke, commenting on the report, congratulated the Directors on the fact that in a very bad time they were able to place shares so well as they had done. He suggested, however, that it would meet the convenience of a large number of shareholders if the Directors would try the experiment of selling shares on the next occasion by tender—a course that had proved very successful with other companies, and these were days of economy. The Chairman intimated that the suggestion would have due consideration, and the report was adopted unanimously.

## Barnsley Gas Company.

Presiding at the annual meeting of the Company last Thursday, Mr. E. G. Lancaster, when moving the report and accounts, said that when it was remembered that the balance-sheet covered eleven months of the war the shareholders must consider the results very satisfactory. The expenditure had gone up by £2105, of which coal accounted for one-third, or £738. The receipts side was both satisfactory and unsatisfactory. The sale of gas was satisfactory—showing an increase of 14 million feet, and £2782 in cash. But residuals had let them down to the extent of £786, or, with sundry deficiencies amounting to £187, a total of £973 to come off the receipts from the increased sale of gas—leaving £1809 to meet the increased expenditure. The result, however, enabled them to pay the usual dividends, with £29 over. The future was not very bright. Coal was going to cost them £5000 more, and residuals were going to let them down again. They had made their contracts, and on tar the loss would be £500, while on liquor the result would be no better than last year. Coke might just hold its own. With such a dark forecast, there was no alternative but to raise the price of gas; and, with grave reluctance, they had done so to the extent of 6d. per 1000 cubic feet. It might be some consolation to customers to know that financially the Company were better off with the old prices for coal and gas than they were with the new ones. They, however, still maintained that gas, even at its present price, was far cheaper than coal for cooking and heating purposes. The accounts showed a balance brought forward of £7579, expenditure £26,100, and receipts £33,698, leaving a balance of net profit to be carried forward of £5460, out of which the dividends have to be paid. The receipts cluded £27,165 by sales of gas, £444 public lighting and other contracts, £824 rent of meters, &c., and £6471 for residual products.

**Cork Gas Consumers' Company.**—The half-yearly report of the Company shows an increase in the revenue as compared with the corresponding half of 1914. This is attributed principally to the high price of coal, which induced consumers to use more gas for cooking, heating, power, &c. The cost of production is considerably higher than usual; but this is compensated for partly by the returns from residuals. After placing £905 to the depreciation fund, the balance of profit and loss is £5239. It is proposed to pay a dividend of 8 per cent. per annum.

**Winchester Water and Gas Company.**—The Directors report that special temporary supplies to the Military Authorities have been required throughout the past half year; and to this is attributable a large addition to revenue. At the same time, the continually increasing cost of coal, other materials, and labour, renders ample provision for the immediate future necessary. The balance of the net revenue account available for dividend is £10,518; and the Directors recommend the payment of a dividend on the preference stock at the rate of 4 per cent. per annum, and on the consolidated ordinary stock at the rate of 4½ per cent. per annum, less income-tax, for the half year.


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## North Middlesex Gas Company.

Compared with the results for the half year ended June 30, 1914, the sale of gas by the Company in the past six months shows an increase of 1,998,400 cubic feet, or 1·3 per cent.; but the revenue from residual products is £461 less, owing to a reduction of the quantity of coal carbonized. The Directors state that the serious difficulty of obtaining supplies of coal during the early part of the half year caused great anxiety; the contract being ultimately cancelled owing to the war. Purchases to cover requirements until the summer of 1916 had been made, but at a very considerable increase in the rates paid, the full effect of which has not yet been felt. The payment of war bonuses to the Company's servants, allowances made to the dependants of employees serving with the forces, and the enhanced cost of all material used by the Company, have entailed a very heavy burden upon the finances of the half year; and the Directors felt it necessary to raise the price of gas 2d. per 1000 cubic feet as from March 31. The net profits for the half year, after charging interest and income-tax, amount to £4678, which, with £4662 brought from the previous half year, makes the disposable balance £9341. At the meeting yesterday, the Directors recommended the declaration of dividends for the half year at the following rates: On the preference capital, 5 per cent. per annum; on the "original" ordinary capital, 11 per cent. per annum; on the "additional" ordinary capital, £7 14s. per cent. per annum. This appropriation will amount to £5373, and leave the reduced balance of £3967 to be carried to the profit and loss account for the current half year. The sum of £17,500 realized by the issue of 1250 "additional" ordinary shares has been credited to capital account.

**Colchester Gas Company.**—Dividends at the rate of 10 per cent. on the old shares and 7 per cent. on the "B" shares were declared at the half-yearly meeting of the Company. The accounts which were adopted showed that the bank balance was £4384; cash in hand, £62; reserve fund investments, £5485; and stock of coal and materials, £4400. The receipts for gas-rental during the half year amounted to £13,891; meter-rental, £608; coke sold, £2130; tar, £1025; sulphate, £608; and bank interest, £58. The credit balance for the half year was £2446; and on the general account there was a credit balance of £13,440.

**Lighting Regulations and Hotel Responsibilities.**—The point was raised, before the Grantham Magistrates on Monday last week, as to the responsibility of hotel keepers for carrying out lighting regulations; Mr. John Fillingham being the defendant. A police witness spoke to seeing bright lights in three hotel windows at midnight on the 18th inst. The solicitor for the defence argued that, being a hotel, defendant could not be held responsible when the lights in the bedrooms were under the control of the guests, as in this instance. Mr. Fillingham explained that the persons stopping in the house were nearly all military men, to whom the regulations should have been well known; but a nominal fine of 2s. 6d. was imposed.

## Southend Gas Company.

The report of the Directors for the half year ended at June 30, which was adopted at the half-yearly meeting of the shareholders last Tuesday, showed that, compared with the corresponding six months of last year, the sale of gas had decreased by 3,168,000 cubic feet, equal to 1·48 per cent., which in the circumstances was considered satisfactory. The number of consumers at June 30 was 18,548—an increase in the half year of 447. The number of automatic meters was 13,125; and during the six months 838 gas cookers were fixed. Mr. Francis Clark, their Engineer and Manager, had tendered his resignation, which was duly accepted by the Directors, who, in acknowledgment of his having served the Company for a period of over 38 years (for 31 years as Manager), had granted him a retiring allowance of £300 per annum. Mr. C. Stuart Shapley, of the Sheffield United Gas Company, had been appointed to the position, and took up his duties on June 16. In order to meet the increased cost of production of gas, arising chiefly from the high prices of coal, the Directors had been exercising every economy over the expenditure on the works and plant, consistent with the proper upkeep and efficiency; and after transferring the sum of £531 from the reserve fund account to the profit and loss account, the balance available for dividend was £7966. The Directors recommend payment of dividends for the half year on the original and new ordinary stocks at the rate of 5½ per cent. per annum, and on the new ordinary "B" stock at the rate of 5⅛ per cent. per annum (all less income-tax at 2s. 1d. in the pound), which amounted to £7496. The total mileage of mains was 80 miles 78 yards. In the absence of the Chairman (Lieut. C. F. Woosnam) on military duty, the adoption of the report was moved by Mr. James Randall, who presided. Dealing with the outlook for the future of the gas industry, he said it was none too rosy, yet there was every indication and promise that they need have no fear. Estimates had been laid before the Board and carefully considered; and it was felt that, by exercising the strictest economy, with improved working, and better prices for residuals, they would be able to pass through the current half year without increasing the price of gas—and this in spite of having to meet a very considerable increase in the price of coal. As referred to in the report, Mr. Francis Clark had resigned the position of Engineer and Manager to the Company, and Mr. C. S. Shapley had been appointed to fill the post. During the short time he had been with the Company, the Directors were thus far satisfied that they had secured the services of an efficient and energetic officer. The report was adopted, and the dividends recommended declared.

**Dearer Gas at Leeds.**—The Leeds Corporation Gas Committee have decided to recommend that the price of gas for heating and lighting be increased 3d. per 1000 cubic feet from Oct. 1. In July the price was increased by 3d.; and this second rise will bring the charge to 2s. 8d. The increase in the cost of coal as compared with prices before the war will mean an addition of from £60,000 to £70,000 a year; and the war bonus will cost the Committee £4000 to £5000 per annum.

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## Watford Gas Company.

The half-yearly meeting of the Company was presided over by Mr. E. J. Slinn (the Chairman), who pointed out that they had had another good six months. Pensions and war allowances stood at £584; but while they deplored the necessity for this expenditure, they were proud to bear their share of the national burden. Their eligible men had answered the call exceedingly well. The figures under the co-partnership scheme were somewhat reduced, in consequence of so many employees taking part in the greater co-partnership movement with our Allies, and partly because of the decreased bonus following on the increased price of gas. On the credit side of the revenue account, the results were first class. Sales of gas, hire of meters, cookers, and fires, and sale of residuals were all substantially increased; and they had sufficient to pay the statutory dividend and mortgage interest, and leave a little in hand. One thing they all regretted was the increase of 4d. per 1000 cubic feet in the price of gas; but the cause of this was well known. The report was adopted, and the statutory dividends were declared. The report stated that 42 of the Company's employees were with the forces. The revenue account showed a profit of £6607, and the profit and loss account £8948 available for distribution.

**Lea Bridge District Gas Company.**—At to-day's half-yearly meeting of the Company, the Directors will report that the increased quantity of gas sold during the six months ended June 30, as compared with the corresponding period of 1914, was 5,285,500 cubic feet, equal to 2·26 per cent. The amount available for dividend (including the sum of £5952 brought forward) is £13,569; and from this the Directors recommend the declaration of dividends at the rates of 5 per cent. per annum on the 5 per cent. preference stock, and 6½ per cent. per annum on the consolidated ordinary stock, both less income-tax, and that £644 be placed to the credit of the reserve fund, leaving £5885 to be carried forward. On May 18, £5000 of additional capital was offered for sale by auction, and was all sold at £118 per £100 of stock.

**Crowborough District Water Company.**—Mr. W. A. Hounsom, who presided at the half-yearly meeting of the Crowborough (Sussex) District Water Company last Saturday week, remarked that as a statutory company they had obligations as well as privileges, and therefore had been unable to pass on to the consumers the increased cost of working. The receipts were £2698, as compared with £2444 in the corresponding six months of 1914; but the expenditure was considerably more, owing to the demands made by the military authorities at Crowborough Camp. The result was that they carried to profit and loss account a sum of £815, against £1082 last year. The number of supplies had increased by 138, to 2133, and 29 per cent. more water had been pumped than in 1914, which in normal circumstances would have left a sum approaching £1400 available. The Directors' report and statement of accounts were carried; and an interim dividend at the rate or 4½ per cent. per annum on the preference shares was declared.

**Barnet District Gas and Water Company.**—The report submitted at yesterday's half-yearly meeting stated that the balance standing to the credit of the profit and loss account amounted to £36,748, out of which the Directors recommended the declaration of a dividend, less income-tax, for the six months ended June 30 at the rates of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. per annum on the "B" stock, and £6 6s. per cent. per annum on the "D" gas and water stocks. The Directors regretted to have to announce that, owing to the increase in the price of coals and other materials, they were compelled to raise the price of gas from 3s. 2d. to 3s. 4d. per 1000 cubic feet from Lady-day last.

**Hebden Bridge Board and War Risks.**—The question of insuring their property against aircraft and bombardment risks was discussed at a meeting last week of the Hebden Bridge and Mytholmroyd Gas Board. It was finally resolved to take no action for the present. A circular letter was submitted from the Local Government Board appealing to the Gas Board to exercise strict economy in every possible way. The Manager (Mr. E. J. Wellens) reported that the consumption of gas was increasing, owing to the night shifts which were being run by firms on Government work. There would, however, be a probable decrease in the quantity of gas used for public lighting, as the Council had again decided to reduce the number of burning hours.

**Farnworth and Kearsley Gas Company.**—At the half-yearly meeting of the Company, it was pointed out by the Chairman (Mr. H. A. Barnes, M.A., J.P.) that they had not yet felt the full effects of the war, and profits were sufficient to pay the maximum dividend. The sale of gas had decreased to the extent of a little over 4 per cent.; but it was pleasing to record a further increase in the number of both ordinary and prepayment consumers. Coal had cost less than in the previous year, owing to advantageous contracts, which had, however, now terminated. In consequence of the increased price of more than 5s. per ton to be paid on the new contracts, they had been compelled to raise the price of gas 5d. per 1000 cubic feet. The works were now insured against air-craft risks. The report was adopted, and maximum dividends of 10 and 7 per cent. were declared.

**Manchester Electrical Undertaking.**—A notice of motion which there was not time to deal with at the last meeting of the Manchester City Council is on the *agenda* paper for discussion to-morrow (Wednesday). It is in the name of Mr. H. Ross Clyne, and proposes the appointment of a Special Committee to inquire into the working and control of the Electricity Department [*ante*, p. 256], and, in addition to empowering such Special Committee, to engage an independent expert (who it is suggested should be associated with the control of some large electrical concern) to advise them, the Committee are authorized to hear the views of citizens who may be either favourable or unfavourable to the policy, present or prospective, of the Electricity Committee. A further suggestion is that the Special Committee report to the City Council upon the necessity of certain proposals being proceeded with or postponed until after the present national financial strain.


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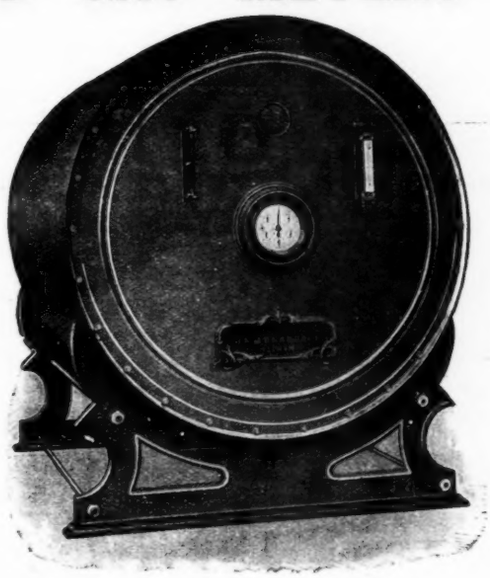

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# GAS COMPANIES IN THE STOCK EXCHANGE.

As might be expected, business on the Stock Exchange continued to be on a very reduced scale last week; but at all events the House was open the full six days. Several markets showed some good points, and the general tone on the whole was decidedly favourable. Home Government issues were firmer. Not the War Loan only showed improvement, but Consols took a stronger position. Canadian Rails also made a good upward movement—harvest prospects giving indications of fair promise. A similar factor imparted firmness to Argentine Rails. Americans advanced, partly in view of the attitude of Washington in regard to the "Arabic" atrocity, and partly encouraged by the hope that the exchange difficulty will be satisfactorily solved. South Africans also participated in the general firmness; and in the Miscellaneous group, oil, copper, rubber, and warlike material and appliances were firm. Almost the only weak market was Home Rails, which were depressed by the coal strike. The phenomenal incident of London and North-Western stock being down below par attracted notice. Business in the Gas Market continued quite on the holiday scale. What bargains were marked were all in the issues of the premier Company, with the exception of a few—totalling less than a dozen—in all the rest. Prices recorded were practically unchanged from those recently obtained. In the Money Market, movements were variable, with alternations of firmness and ease.

Bargains done for cash during the week were as follows: On Monday, Continental Union 39½, 40, Gas Light ordinary 78½, 79, 79½, 79¼, ditto maximum 58, ditto debenture 62½, 63½, Imperial Continental 55, 55. On Tuesday, Gas Light ordinary 78¾, 78⅞, 79, 79½, 79¼, ditto maximum 58, 58⅝. On Wednesday, Gas Light ordinary 78¾, 79, 79¼, ditto maximum 58, 58¼, 58⅜, 58½, 59, Primitiva preference 3½. On Thursday, Brentford "B" 85, European 12½, 12⅜, Gas Light ordinary 79, 79¼, South Metropolitan debenture 60½. On Friday, Aldershot 79, 79½, Gas Light ordinary 78¾, 79, 79¼, Liverpool 96½, Primitiva preference 3⅜, South Metropolitan debenture 61. On Saturday, Gas Light ordinary 78½, 79.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

## LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING AUG. 28.

| Issue. | Share. | When Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices, July 30. | Yield on Highest Closing Price. | Lowest and Highest Prices of Bargains. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | £ s. d. | |
| 1,551,868 | Stk. | April 8 | 3½ | Alliance & Dublin Ord. | 59—64 | 3 18 2 | .. |
| 374,000 | ,, | July 10 | 4 | Do. 4 p.c. Deb. | 76—79 | 5 1 3 | .. |
| 280,000 | 5 | April 29 | 7½ | Bombay, Ltd. | 5⅛—6⅜ | 5 17 8 | .. |
| 50,000 | 10 | Feb. 26 | 16 | Bournemouth Gas and Water — 10 p.c. | 29—30 | 5 6 8 | .. |
| 373,480 | 10 | ,, | 7 | Bournemouth Gas and Water — B 7 p.c. | 15—15½ | 4 10 4 | .. |
| 95,000 | 10 | ,, | 6 | Bournemouth Gas and Water — Pref. 6 p.c. | 13½—14 | 4 5 9 | .. |
| — | — | — | — | Bournemouth Gas and Water — Deb. | .. | — | .. |
| 880,000 | Stk. | Feb. 26 | 14 | Brentford Consolidated | 261—266 | 5 5 3 | .. |
| 880,000 | ,, | ,, | 11 | Do. New | 204—209 | 5 5 3 | 85 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 109—111 | 4 10 1 | .. |
| 206,250 | ,, | June 11 | 4 | Do. 4 p.c. Deb. | 91—93 | 4 6 0 | .. |
| 217,380 | Stk. | Feb. 26 | 11 | Brighton & Hove Orig. | 208—213 | 5 3 4 | .. |
| 244,200 | ,, | ,, | 8 | Do. A Ord. Stk. | 154—159 | 5 0 8 | .. |
| 630,000 | 20 | Mar. 26 | 12½ | British | 44—45 | 5 11 1 | .. |
| 120,000 | Stk. | June 26 | 4 | Do. 4 p.c. Deb. Stk. | 88—90 | 4 8 11 | .. |
| 245,771 | Stk. | June 26 | 4 | Buenos Ayres 4 p.c. Deb. | 85—87 | 4 12 0 | .. |
| 100,000 | 10 | — | — | Cape Town & Dis., Ltd. | 1½—2½ | — | .. |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 4—6 | — | .. |
| 100,000 | Stk. | June 26 | 4½ | Do. 4½ p.c. Deb. Stk. | 70—75 | 6 0 0 | .. |
| 157,150 | Stk. | Feb. 26 | 5 | Chester 5 p.c. Ord. | 108—110 | 4 10 11 | .. |
| 1,513,280 | Stk. | Feb. 12 | 5/9/4 | Commercial 4 p.c. Stk. | 106—108 | 5 1 2 | .. |
| 560,000 | ,, | ,, | 5½ | Do. 3½ p.c. do. | 103—105 | 5 1 6 | .. |
| 475,000 | ,, | June 11 | 3 | Do. 3 p.c. Deb. Stk. | 69½—71½ | 4 3 11 | .. |
| 800 000 | Stk. | ,, | 4 | Continental Union, Ltd. | 76—79 | 5 1 3 | 39½—40 |
| 300 000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 115—118 | 5 18 8 | .. |
| — | — | — | — | Croydon B and C 7 p.c. | .. | — | .. |
| 492,270 | Stk. | — | 6 | Derby Con. Stk. | 123—125 | 4 16 0 | .. |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 102—104 | 3 16 11 | .. |
| 1,002,180 | 10 | July 29 | 10 | European, Ltd. | 17½—18 | 5 11 1 | 12½—12⅝ |
| 16,362,910 | Stk. | Feb. 12 | 4/17/4 | Gas Light and Coke — 4 p.c. Ord. | 98—102 | 4 15 6 | 78½—79¼* |
| 2,600,000 | ,, | ,, | 3½ | Gas Light and Coke — 3½ p.c. max. | 76—79 | 4 8 7 | 58—59* |
| 4,062,235 | ,, | ,, | 4 | Gas Light and Coke — 4 p.c. Con. Pref. | 96—99 | 4 0 10 | .. |
| 4,674,850 | ,, | June 11 | 3 | Gas Light and Coke — 3 p.c. Con. Deb. | 72½—74½ | 4 0 6 | £2½—63½ |
| 130,000 | ,, | ,, | 10 | Gas Light and Coke — 10 p.c. Bonds | .. | — | .. |
| 258,740 | Stk. | Mar. 12 | 5 | Hastings & St. L. 3½ p.c. | 87—89 | 5 12 4 | .. |
| 70,000 | 10 | April 29 | 11 | Hongkong & China, Ltd. | 16½—16⅝ | 6 11 4 | .. |
| — | — | — | — | Hornsey 7 p.c. | .. | — | .. |
| 181,000 | Stk. | Mar. 12 | 7½† | Ilford A and C | 151—154 | 5 2 4 | .. |
| 65,780 | ,, | ,, | 6½† | Do. B | 115—118 | 5 8 0 | .. |
| 65,500 | ,, | June 26 | 4 | Do. 4 p.c. Deb. | 92—94 | 4 5 1 | .. |
| 4,940,000 | Stk. | May 14 | 9 | Imperial Continental | 150—160 | 5 12 6 | 55—56 |
| 1,335,000 | Stk. | Feb. 12 | 3½ | Do. 3½ p.c. Deb. Red. | 84—86 | 4 1 5 | .. |
| 200,242 | Stk. | Mar. 12 | 6½ | Lea Bridge Ord. 5 p.c. | 119—121 | 5 7 5 | .. |
| 561,000 | Stk. | Feb. 26 | 10 | Liverpool 5 p.c. Ord. A | 211—213 | 4 13 11 | 96½* |
| 718,100 | ,, | ,, | 7 | Liverpool 5 p.c. Ord. B | 146—14 | 4 14 7 | |
| 306,083 | ,, | June 26 | 4 | Do. 4 p.c. Pr. Deb. Stk. | .. | — | — |
| £ | | | p.c. | | | £ s. d. | |
| 75,000 | 5 | June 11 | 6 | Malta & Mediterranean | 4⅛—4⅜ | 6 9 9 | .. |
| 250,000 | 100 | April 1 | 4½ | Met. of Melbourne 4½ p.c. Deb. | 99—101 | 4 9 1 | .. |
| 541,930 | 20 | May 28 | 4 | Monte Video, Ltd. | 11½—12 | 6 13 4 | .. |
| 1,775,892 | Stk. | July 29 | 4½ | Newc'tle&G'tesh'd Con. | 98½—99½ | 4 10 6 | |
| 529,705 | Stk. | June 26 | 3½ | Do 3½ p.c. Deb. | 83—83 | 4 4 10 | .. |
| 55,940 | 10 | Feb. 26 | 7/14/0 | North Middlesex 7 p.c. | 14—15 | 5 2 8 | .. |
| 300,000 | Stk. | May 14 | 8 | Oriental, Ltd. | 117—122 | 6 11 2 | .. |
| 60,000 | 5 | Mar. 26 | 10 | Ottoman, Ltd. | 7¼—7⅜ | 6 9 0 | .. |
| 60,000 | 50 | Feb. 26 | 13 | Portsea, Island B | 128—131 | 4 19 8 | .. |
| 100,000 | 50 | ,, | 12 | Do. C | 118—121 | 4 19 2 | .. |
| 52,000 | 50 | ,, | 10 | Do. D | .. | — | .. |
| 249,980 | 5 | April 29 | 8 | Primitiva Ord. | 5½—6 | 6 13 4 | .. |
| 499,960 | 5 | June 26 | 5 | ,, 5 p.c. Pref. | 4⅝—5 | 5 0 0 | 3½—3⅝ |
| 521,600 | 100 | June 2 | 4 | ,, 4 p.c. Deb. | 91—93 | 4 6 0 | .. |
| — | — | — | — | ,, ,, 1911 | .. | — | .. |
| 346,198 | Stk. | June 26 | 4 | River Plate 4 p.c. Deb. | 85—87 | 4 12 0 | .. |
| 150,000 | 10 | May 14 | 6 | San Paulo 6 p.c. Pref. | 10½—11 | 5 9 1 | .. |
| 125,000 | 50 | July 1 | 5 | San Paulo 5 p.c. Deb. | 47—49 | 5 2 0 | .. |
| 135,000 | Stk. | Mar. 12 | 10 | Sheffield A | 223—224 | 4 9 8 | .. |
| 209,984 | ,, | ,, | 10 | Do. B | 222—224 | 4 9 8 | .. |
| 523,500 | ,, | ,, | 10 | Do. C | 220—222 | 4 10 1 | .. |
| 90,000 | 10 | May 28 | 9 | South African | 10½—11½ | 7 16 6 | .. |
| 6,429,895 | Stk. | Feb. 12 | 5/4/0 | South Met., 4 p.c. Ord. | 111—113 | 4 16 8 | .. |
| 1,895,445 | ,, | July 10 | 3 | Do. 3 p.c. Deb. | 72½—74½ | 4 0 6 | 60½—61 |
| 209,820 | Stk. | Feb. 26 | 8½ | South Shields Con. Stk. | 157—159 | 5 6 11 | .. |
| 952,795 | Stk. | Feb. 26 | 6 | S'th Suburb'n Ord. 5 p.c. | 114—116 | 5 3 5 | .. |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 110—112 | 4 9 3 | .. |
| — | — | — | — | Do. West Kent. | .. | — | .. |
| 137,058 | ,, | June 26 | 5 | Do. 5 p.c. Deb. Stk. | 116—118 | 4 4 9 | .. |
| 629,740 | Stk. | May 14 | 5 | Southampton Ord. | 99—102 | 4 18 0 | .. |
| 120,000 | Stk. | Feb. 12 | 7½† | Tottenham District — A 5 p.c. | 135—138 | 5 8 8 | .. |
| 742,275 | ,, | ,, | 6† | Tottenham District — B 3½ p.c. | 115—117 | 5 2 7 | .. |
| 181,255 | ,, | June 26 | 4 | Tottenham District — 4 p.c. Deb. | 87—89 | 4 9 11 | .. |
| 182,380 | 10 | Dec. 30 | 5 | Tuscan, Ltd. | 5—6 | 8 6 8 | .. |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 93—95 | 5 5 8 | .. |
| 236,476 | Stk. | Mar. 12 | 5 | Tynemouth, 5 p.c. max. | 108½—109½ | 4 11 4 | .. |
| | | | | Wandsworth, Wimbledon, and Epsom— | | | |
| 80,000 | Stk. | Feb. 26 | 8⅜ | Wandsworth A 5 p.c. | 151—156 | 5 7 4 | .. |
| 255,636 | ,, | ,, | 6⅞ | ,, B 3½ p.c. | 129—134 | 5 2 7 | .. |
| 108,075 | ,, | ,, | 5/17/8 | ,, C 3½ p.c. | 110—115 | 5 2 0 | .. |
| 852,000 | ,, | ,, | 6½ | Wimbledon 5 p.c. | 117—122 | 5 0 5 | .. |
| 98,000 | ,, | ,, | 6⅜ | Epsom 5 p.c. | 121—126 | 5 5 2 | .. |
| 88,416 | ,, | June 26 | 8 | 3 p.c. Deb. Stk. | 66—69 | 4 6 11 | .. |

* Ex Div.


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